



MARCH, 1921

TWENTY
CENTS

"THE STORY OF THE TRANSCONS"—IN THIS ISSUE

H.R. NICK

Have You Purchased Your Paragon-Radiotron Combination?

The most economical Vacuum Tube Control Unit on the market. Think of it—complete with grid condenser, grid leak, tube socket, rheostat, and one of the new

Radiotron UV 200 Vacuum Tubes, All for \$11.00

Or with 1 block Radisco

Better "B" Battery, \$13.65

Paragon Unit \$6.00

Radiotron UV 200 . . . 5.00

Radiotron UV 201 . . . 6.50

Radiotron UV202 5 Watt

Transmitting Tube . . . 8.00



AJAX Buzzer, - 50 Cents

A high tone adjustable buzzer with silver contacts and two adjusting screws located on top of buzzer. A wide range of tone may be secured by a very slight turn of the screws.

Price 50 cents

SPECIAL

We have a special lot of Roller-Smith Type T-A-W Radio hot wire meters. Three types—0-1A, 0-2.5A, 0-5A. While they last.

\$5.00 Each

Radisco "B" batteries 22.5 volts, large	\$2.65
Radisco "B" batteries 22.5 volts, small	1.50
General Radio switch, large . . . . .	.60
General Radio switch, small . . . . .	.40
Black Empire cloth tubing, per foot . . . . .	.13
G. A. Grid Condenser . . . . .	.35
G. A. combination Grid Leak and Condenser . . . . .	.50
G. A. telephone condenser . . . . .	.35
Headquarters for Complete receiving and transmitting outfits, small parts, antenna equipment, VT's, C.W. equip- ment, etc.	



A New Key, - AJAX

Lever type, all brass, Machine made, heavy
contacts. B.D. base and knob.

Price \$1.50

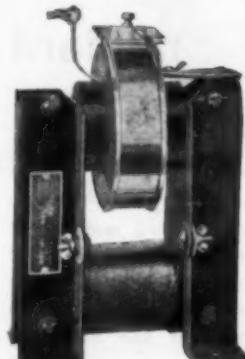
ATLANTIC RADIO COMPANY, INC.

88 Broad St.
Boston, 9, Mass.

Request Bulletin 14

Branch, 15 Temple St.
Portland, Maine

Important Reductions in Prices of Thordarson Apparatus



TYPE "RS"
TRANSFORMER

Type "RS" Transformers

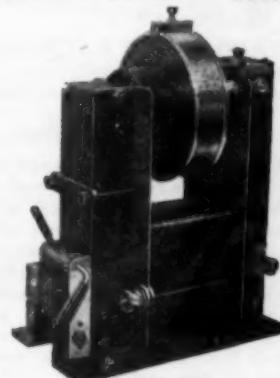
A non-resonant transformer with a lower secondary potential designed to give you the highest possible power factor.

1 KVA 15000 VOLTS.....	\$30.00
½ KVA 10000 VOLTS.....	20.00
¼ KVA 8000 VOLTS.....	15.00

Type "R" Transformers

The famous resonant transformer affording the highest practical voltages.

1 KVA 25000 VOLTS.....	\$40.00
¾ KVA 10000 VOLTS.....	28.00
½ KVA 10000 VOLTS.....	22.00



TYPE "R"
TRANSFORMER

Other Thordarson Equipment

POWER CONDENSER (.0018-.009 MF).....	\$25.00
OSCILLATION TRANSFORMER	10.00
R8 ROTOR (8 TOOTH).....	5.00
R16 ROTOR (16 TOOTH).....	5.00
R12 ROTOR (12 TOOTH).....	3.00

(Specify diameter of motor shaft when ordering rotors.)

A POSTAL BRINGS OUR CIRCULAR TO YOU.

Thordarson Electric Manufacturing Co.

517 S. JEFFERSON ST.,

CHICAGO, ILL.



Variable Standard V. T. Battery

No. 7650 Patent Pending

is especially adaptable for use with latest types of gaseous content vacuum tubes.

Its variable features and method of variation are found in no other "B" Battery, and this combined with the long-life features of the STANDARD VT BATTERY make it the desirable one for you to use.

PRICE \$3.50 COMPLETE WITH PLUG.

STANDARD VT BATTERIES are also sold in non-variable types such as type #7623, priced at \$1.50 and type #7625, priced at \$2.65. These are REAL cast en bloc batteries, made for unexcelled service and full satisfaction.

Your Duo-Lateral Wound Coils Are Ready

JUST a word of explanation: Our first advertisement caused such an upheaval in radio circles that we were swamped with inquiries. Indeed one large manufacturer of radio apparatus immediately placed his contract with us, taking over our entire production. As a result, we were obliged to turn down orders. THAT was up till a short while ago. Now we have succeeded in doubling our productive capacity, and Duo-Lateral Coils are available to every one in the radio field. We can make prompt shipments from stock. YOUR DUO-LATERAL COILS ARE READY TO BE SHIPPED THE MOMENT YOUR ORDER IS RECEIVED.

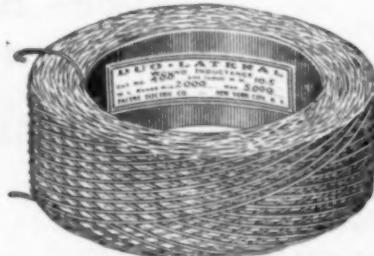
REMEMBER: Duo-Lateral Coils are recognized for:

- | | |
|------------------------------------|------------------------------------|
| 1. Lower natural period | 4. Lower direct current resistance |
| 2. Lower high frequency resistance | 5. Higher self-inductance |
| 3. Very low distributed capacity | 6. Mechanically stronger. |

Bulletin P-1Q, containing valuable engineering data, constants and prices of numerous sizes of Duo-Lateral Coils, covering practically every wave-length used, is yours for the asking.

AMATEURS—Buy our products from your dealer.

DEALERS—Have your our proposition?



Pacent Electric Company, Inc.

LOUIS GERARD PACENT, Pres.

Wireless Improvement Company's Complete Line.

SALES AGENTS FOR: DUBILIER CONDENSER CO., ELECTRICAL PRODUCTS MFG. CO., RICHTER-SCHOTTLER CO., H. W. SULLIVAN OF LONDON, THE RAWSON ELECTRICAL INSTRUMENT CO., C. BRANDES, INC., AND OTHERS.

Now representing the Wireless Improvement Co. exclusively

150 NASSAU STREET

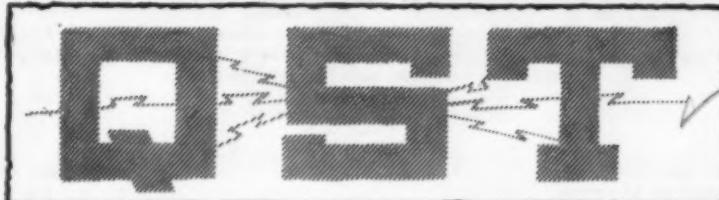
Telephone
Beekman 5810

NEW YORK CITY

MAR 19 1921

©CLB489570

THE OFFICIAL ORGAN OF THE A.R.R.L.



MARCH, 1921

VOLUME IV

No. 8

CONTENTS

The Story of the Transcons	K. B. Warner	5
High-Frequency Stuff	"Breck"	13
6JD and Its Operator		17
The Power Tubes Arrive		18
Some Experimental Regenerative Tuners	McMurdo Silver	19
New Apparatus		20
Transatlantic Tests Fail		21
A.R.R.L. "CQ" Party, April 1st		22
A Description of 4XP, Savannah		23
Break-In Operation	D. W. Richardson	24
If You Can't Afford a High-Priced Rotary	Wm. E. K. Middleton	24
Amrad Activity		25
The Log of an Amateur at Sea		25
Station Reports		27
Editorials		29
The Operating Department		31
Amateur Radio Stations		41
With the Affiliated Clubs		45
"Strays"		48
Radio Communications by the Amateurs		51
Calls Heard		58

Q S T is published monthly by The American Radio Relay League, Inc., at Hartford, Conn. Kenneth B. Warner (Secretary, A. R. R. L.), Manager and Editor.

Subscription price, \$2.00 per year, anywhere. Single Copies, 20 Cents.

Entered as second-class matter May 29, 1919, at the post office of Hartford, Connecticut, under the Act of March 3, 1879.

Copyright, 1921, by The American Radio Relay League, Inc.
Title registered at United States Patent Office.

THE AMERICAN RADIO RELAY LEAGUE, Inc.
HARTFORD, CONN.

THE AMERICAN RADIO RELAY LEAGUE

"A national non-commercial organization of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, and for scientific growth."

OFFICERS

President
HIRAM PERCY MAXIM
Hartford, Conn.

Vice President
CHAS. A. SERVICE, JR.
Bala, Pa.

Traffic Manager
F. H. SCHNELL
61 Waverly Bldg.,
Hartford, Conn.

Treasurer
A. A. HEBERT
Nutley, N. J.

Secretary
K. B. WARNER
Hartford, Conn.

DIRECTORS

A. E. BESSEY
Sunnyvale, Calif.

V. F. CAMP
Brightwaters, L. I.

J. M. CLAYTON
Little Rock, Ark.

F. M. CORLETT
Dallas, Tex.

S. KRUSE
Washington, D. C.

W. T. GRAVELY
Danville, Va.

F. F. HAMILTON
Indianapolis

A. A. HEBERT
Nutley, N. J.

HIRAM PERCY MAXIM
Hartford, Conn.

C. A. SERVICE, JR.
Bala, Pa.

J. O. SMITH
Valley Stream, L. I.

H. L. STANLEY
Babylon, L. I.

C. H. STEWART
St. David's, Pa.

K. B. WARNER
Hartford, Conn.

M. B. WEST
Waukegan, Ill.

F. H. SCHNELL
Hartford, Conn.

H. M. ANTHONY
Muncie, Ind.

OPERATING DEPARTMENT

TRAFFIC MANAGER
F. H. Schnell

ATLANTIC DIVISION
Manager
Chas. H. Stewart
St. David's, Pa.

Asst. Mgr., Central Sec.
John DiBlasi
13 Sinclair Ave.
Flushing, L. I.

Asst. Mgr., Southern Sec.
Edw. B. Duvall
3909 Cottage Ave.
Baltimore, Md.

EAST GULF DIVISION
Manager
E. H. Merritt
192 W. North Ave.
Atlanta, Ga.

CENTRAL DIVISION
Manager
R. H. G. Mathews
1816 Carmen Ave.
Chicago

Assistant Manager
Chas. H. Zeller
4782 N. Maplewood Ave.
Chicago

WEST GULF DIVISION
Manager
Frank M. Corlett,
1101 East Eighth St.
Dallas, Tex.

ALASKAN DIVISION
Manager
Roy Anderson, 717
P. O. Box 206
Ketchikan, Alaska

ROCKY MOUNTAIN DIV.
Manager
M. S. Andelin
Richfield, Utah

PACIFIC DIVISION
Manager
A. E. Bessey
Sunnyvale, Calif.

Assistant Manager
E. G. Arnold
181 No. 17th St.
San Jose, Calif.

ST. LAWRENCE DIVISION
Manager
Albert J. Lorimer
248 Mackay St.
Montreal, Que.

ONTARIO DIVISION
Manager
A. H. Keith Russell
253 Markham St.
Toronto, Ont.

NEW ENGLAND DIVISION

Manager
Guy R. Entwistle
137 Sutherland Road
Brookline, Mass.

ROANOKE DIVISION

Manager
W. T. Gravely
854 Main St.
Danville, Va.

DELTA DIVISION

Manager
John M. Clayton
1801 Welch St.
Little Rock, Ark.

MIDWEST DIVISION

Manager
L. A. Benson
4942 Wiesehan Ave.
St. Louis

DAKOTA DIVISION

Manager
Boyd Phelps
3344 First Ave., South
Minneapolis, Minn.

NORTHWESTERN DIV.

Manager
John D. Hertz
P. O. Box 2089
Portland, Ore.

ADVISORY TECHNICAL COMMITTEE

C. S. BALLANTINE
WM. C. BALLARD, Jr.
LEROY M. E. CLAUSING
FRANK CONRAD

MINTON CRONKHITE
J. H. DELLINGER
C. L. FARRAND
PAUL F. GODLEY
LEO C. YOUNG

L. A. HAZELTINE
C. D. TUSKA
R. H. G. MATHEWS
J. O. SMITH

Address General Correspondence to Executive Headquarters, Hartford, Conn.



A Magazine Devoted Exclusively to Amateur Radio

The Story of The Transcons.

By K. B. Warner

FELLOWS, we did it! Smashed it into bits—just naturally lambasted the everlasting stuffing out of it! "Aint it a grand an' glorious feeling?" It is! Tiddle-de-da-de-doo!, as our prize rooster Geschnell crowed when he put the final licks in.

Do you ask why all these screamers? Be it known to you, Fellow A.R.R.L. Members, that this little old organization of ours created some glorious additions to the history of Citizen Wireless in the Transcontinental Relay Tests of middle January, when we broke the previous record so badly that you'll never even find the pieces. We put one across and back in six and a half minutes! It was truly F.B. In the weeks that have since passed we have managed to make up a little of our lost sleep and are gradually coming back to earth, so that now we can take up the reports and see just how we accomplished these things that brought joy and pride to the heart of every A.R.R.L. man. So, from a vast pile of reports received at Headquarters, the story is slowly being put together. There are still places to be heard from and some blanks still exist in our story, but for the most part we now know how the messages moved and are able to present the tale in order that we may study it and take lessons therefrom for our next attempt.

The plans for the transcons were first announced in the December QST and the schedules appeared in the January number. It will be recalled that the scheme was to have relays for several nights in a row, with several messages going each night, not only so that all parts of the country might participate but because the QRM made it more realistic and would give a better test of just what we could do. During these first few nights, too, the relay machinery would be getting into smooth running and the unintentional interferers would be rounded up, so that

conditions would be well lined up for a pure speed test on the final night. Our entire League seemed to enter wholeheartedly into the idea, and great interest was manifested everywhere. All the Division Managers and their helpers worked hard on the job, local organizations assisted in spreading the news and preparing local QRM-control to make operating easier, and the individual station owners were full of enthusiasm to a man, not only those who were on the routes but those whose chief duty it was to keep quiet. In addition to this splendid co-operation from the organization we were blessed with almost perfect weather over the eastern two-thirds of the country.

The results of the tests are now history, but a glorious history it is. All amateur records went to smash before our almost perfectly-working machine and indeed during these tests we broke our own records almost as fast as we could establish them. The copies of the logs sent into headquarters tell a most interesting story in every case, and the operators who listened in on these nights have a record of radio history in its making.

In all our transcontinental tests the scheme has been to put a message from one coast to the other and get back an answer—a round trip. Therefore unless a reply is actually returned to the point of origin we cannot count it a success, regardless of how quickly the message may have moved across the country one way. Nor when they become badly garbled in transit can they be counted successful, regardless of the speed. Of the messages between Portland, Me., and Portland, Ore., two completed the round trip OK, and one of them would have surpassed our long-standing record of 1 hours 20 mins. if the signature hadn't been garbled. Two of the three messages between Hartford and Los Angeles were completed, one of which established a good improvement on our

old record. Of those between San Francisco and Boston, only one can be counted a success. Transcons 4, between Ellendale, N. D., and New Orleans, were child's play, on two nights hanging up figures of 27 and 28 minutes for the round trips. On the last night a series of messages was handled between Hartford and the west coast, and new figures of 23 mins., 13 1/2 mins., 7 1/2 mins., and finally 6 1/2 mins., were established!

We have concluded that the best way to set forth the story is to tell briefly what happened to each message. It must be borne in mind that our data are not complete, that reports from some of the stations conflict, and that there will unquestionably be little inconsistencies in the record, with credit omitted where credit is due and unintentionally placed where it does not belong. Our readers are asked to fill in the missing links or correct any errors they observe, in order that our official record may be a true one. It will be noted that in many cases the messages did not move as scheduled, and that when apparently "stuck" some unscheduled station who had copied it leaped into the breach and QSR'd without actually communicating with the station from which it had been copied. We wish to explain that in our presentation of how the messages traveled we are listing what appears to be the correct route over which they actually moved to their destination, and such records will not show all the stations to whom a message was forwarded for relay.

FIRST NIGHT—Jan. 14-15

No. 1. Figures in Eastern Standard Time. "Transcon 15 msg nr 1, Portland, Me., to The Mayor of Portland, Ore. Portland, Maine sends greetings to her big sister of the Pacific Coast.—Charles B. Clarke, Mayor." This message apparently started from Portland, Me., promptly at 1 o'clock, via 1FV, moving to 1DY. 1BBL couldn't hear 1DY, so 1AW connected up 1DY and 2RK. The latter got it and passed it to 9ZN at 1:25, who gave it to both 9JN and 9WU. 9WU started it to 7ZG, but 7CC copied it direct from 9WU, QSL'd, and passed it on to 7DA in Portland at 1:35. Actually moved: 1FV-1DY-2RK-9ZN-9WU-7CC-7DA.

The reply, leaving Portland via 7DA at 1:40, read "Transcon 15 reply nr 1, Portland, Ore., to Mayor, Portland, Me. The mayor of Portland, Ore., reciprocates the kind greetings from Portland, Me., in true western spirit.—Geo. Baker." This went to 7CC, to 7ZG at 2:05, to 9WU at 2:25. 9ZN was busy, and 9WU gave it to 9ZL at 2:27. 9ZL gave it to 2SZ after failing to get 9ZN, but it got no further until 9WU repeated it to 9ZN at 2:35. 9ZN then started it to 2RK, but 1AW copied

all of it direct except sig. 9ZN heard 1AW asking 2RK for the sig., and shot it again, making the transmission direct 9ZN to 1AW at 2:47. Meanwhile 1FV was QRX, and 1AW immediately started to him. Some repeats were necessary, and 1TS rendered valuable help to 1AW in copying 1FV's weak and fading signals. His QSL was received at 3 o'clock, at which time 2RK had just succeeded in getting it to 1DY too, but as 1FV was Portland itself, 1DY cancelled. Actually moved via: 7DA-7CC-7ZG-9WU-9ZN-1AW-1FV.

Elapsed time, 2 hours flat.

No. 2. Figures in Eastern Standard Time. 1AW had the following: "Transcon 15 msg nr 2, Hartford, to Managing Editor, Los Angeles Times, Los Angeles, Cal. Hartford Courant, America's oldest newspaper, sends greetings by wireless to one of greatest papers in west—Managing Editor, Courant." 2RK QSL'd this at 1:08, and 8ZW, who had copied from 1AW, gave him an immediate QSL and broke to 5YH. Meanwhile BCO had copied 1AW and QSR'd to 9LR, who in turn gave it to 6IG, and logs received seem to show that 6IG was heard calling 6JD. However, the message never got thru. In some manner 5ZA picked it up and passed it on to 6ZH about 1:30, but it does not seem to have got past 6ZH. This attempt was a failure, but the effort to get thru and back made some few members for "The Boiled Owl Club", for many of us sat up waiting for that message until the sun was up. Tracers were started out and it was learned later that it had been hours getting across the mountains. 9ZN and 9LR and 1AW stayed on the job until 1 a.m., with the air quiet and the route open as far as the Rockies, but the reply did not return.

No. 3. Pacific Standard Time. Promptly at 10 o'clock 6ZE gave 6BJ the following message: "Transcon 14 msg nr 3, San Francisco, to Boston American, Boston, Mass. Greetings good luck for 1921 from the far west paper of the Hearst chain.—San Francisco Examiner." 6BJ gave it to 6ZO, and he to 6ZM at 10:08, but the latter was never able to get rid of it because his wave, 375 meters, was higher than the bunch were listening on. 6IG came to the rescue, altho we don't know where he got his copy, and forwarded to 5ZA, thence to 9LR, and so to BCO at 10:15. Fifteen minutes from Frisco to St. Louis! BCO gave it to 8ZY at 10:19, but the eastern stations were all busy with Nr. 1 and Nr. 2, and 8ZY had to hold it—like a hot potato. 8ZL had copied it and was heard trying to give it to 2RK at 10:35, but QRM. 8ZY passed it to 8ZW, whose very-QSA signals clipped thru the jam and deposited it safely at 1AW at 10:44. 1AW called 1DY and 1CK with it, and with the valiant help of 1TS secured a

QSL from 1DY at 2 o'clock, making one hour across. Actually moved via: 6ZE-6BJ - 6ZO - 6IG - 5ZA-9LR-BCO-8ZY-8ZW-1AW-1DY.

1DY had difficulty in securing a reply—somebody up that way seemed to object to being disturbed at that hour of night to answer the message. It even looked at one time like the effort would have to be abandoned, but 9ZN reported both routes were open to the coast and for the love of Mfd. couldn't we get an answer? Oh Boy but it is inspiring to hear that roll in over the air: "Both routes open to coast"! 1DY decided it MUST be done, and at 1:47 started reply to 1AW, which was copied with the assistance of 1TS. This read: "Transcon 14 reply nr 3, Boston, to San Francisco Examiner, San Francisco. Your wireless greetings received. It's a long way from Mass. to the Golden Gate and good wishes for your success this year.—Boston American." 1AW popped this to 9ZN and got his QSL at 1:53, but 9LR had copied 1AW direct and immediately started to 6JT with it. It never finished, and further routing is unknown.

This attempt must be called a failure.

No. 4. Central Standard Time. 9WU gave the following to 9JN at 11:07: "Transcon 14 msg nr 4, Ellendale, N. D., to New Orleans Item. Cotton planters join National Farm Bureau.—Leader." BCO intercepted it and passed to 5YH, who gave it to 5ZP at 11:15—eight minutes. Mr. Chesser, of the "New Orleans Item", hardly knew how to reply to such a message, and in error the answer was addressed to Hartford instead of Ellendale. It read: "Transcon 14 reply nr 4, New Orleans, to A.R.R.L., Hartford, Conn. Msg recd congratulations on good work.—Chesser Item New Orleans." 5ZP gave this to 5YH, thence to BCO at 11:34, 8ZL at 11:41, thence to 2RK and from him to 1AW at 12 midnight. Being wholly unexpected, 1AW didn't know what to do with this message or what it meant, and indeed it seems most of the bunch thought it was phony and the work of some practical joker who was trying to give us a reply to Nr. 2 before it started. 1AW asked 2RK how it had come, and the redoubtable "KH" answered with a laconic Morse "C" and asked 8ZL from whence came this specimen. The lady promptly gave the full routing—5ZP-5YH-BCO-8ZL—and then it was evident that a mistake had been made and that this was indeed the reply to Nr. 4. Altho misrouted it still embodied a good performance: Ellendale to Hartford via New Orleans in 53 minutes.

Special. Eastern Standard Time. While we were all waiting for the reply to Nr. 2 to come back and for Boston to frame an answer to Nr. 3, the Traffic Manager

decided to try a special from 1AW, since the routes seemed open and conditions better for getting thru than they had been for years. Accordingly, at 4:13 1AW gave 9ZN the following: "Transcon 15 Special, Hartford, to Bessey, 6ZK. Temperature thirty weather clear here this morning hows Sunnyvale.—Maxim". 9ZN QSL'd at 4:14, broke immediately to 9LR, who in turn QSL'd at 4:15—as pretty work as you could want to hear. 9LR apparently got it to 6JT at 4:20, but it did not get thru and its further history is unknown.

This was pretty good for the first night. In the east we were crippled by the absence of 1HAA, who had antenna trouble, but it was seen that with more stations on the job and QRM a little better under control, we could do big things. The co-operation was wonderful. 1AW maintained constant communication with 9ZN from 2 a.m. to 7a.m. with all the ease of local work and not the least bit of fading until 6:45 when the sun began to rise in Hartford and 9ZN began to weaken rapidly.

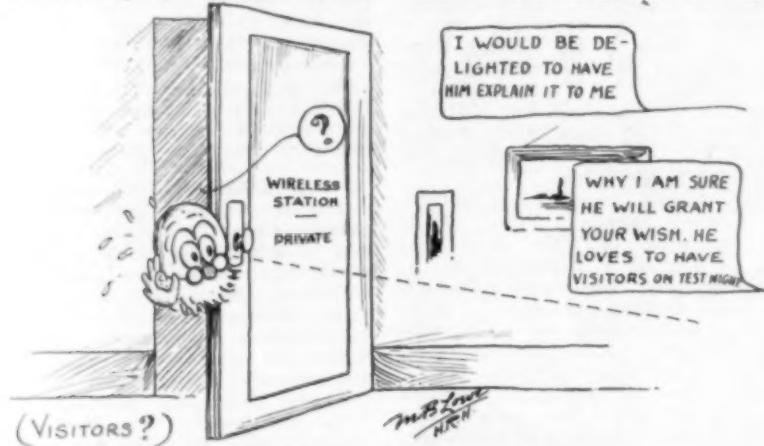
SECOND NIGHT—Jan. 15-16

No. 1. Eastern Standard Time. This message was "a regular book": "Transcon 16 msg nr 1, Portland, Me., to W. D. B. Dodson, Secretary, Chamber Commerce, Portland, Ore. Best greetings for 1921 from Portland, Me., Chamber Commerce to Chamber Commerce, Portland, Ore. Thus far we are enjoying a very open winter; very little snow; no severe cold.—E. H. McDonald, Executive Secretary." This presumably left Portland about 1 o'clock via 1FV, moving to 1CK, who gave it to 1AW at 1:45. 2RK was on too, and signified he had it OK direct by calling 9ZN, so 1AW QSL'd to 1CK and started giving him Nr. 3 for Boston while 2RK attempted to put Nr. 1 west. 9ZN gave it to 9WU, but 9WU couldn't get rid of it. No one was on west of him, and altho he broadcasted it he got no QSL. This was fortunate, however, as 2RK had lost part of it. 8ZW had copied more than that direct from 1CK, he told 2RK, and considerable chewing took place up past 2 o'clock. As 8ZW said in horror: "Nr. 1 going west with two thirds lost and 9ZN don't know the difference". "WO" must have thought it was long enough as it was. 8ZW, 8ZY, 2RK and others of the gang were running around in circles until 8ZW gave the correct copy to 8ZY at 1:56, and the latter finally succeeded in getting 9ZN's ear at 2:10, from whence it moved to 9LR, and to 6ZH at 2:36. 6ZH gave it to 6ZM but was copied direct by 6ZO, who gave it to 7DA in Portland at 2:45. The central route scores on this one, and a hard message it was, too. Actually moved: 1FV - 1CK - 8ZW - 8ZY - 9ZN - 9LR - 6ZH - 6ZO - 7DA.

7DA's reply read: "Transcon 16 reply nr 1, Portland, Ore., to E. H. McDonald, Portland, Me. Greetings; enjoying no winter at all.—Van Duzen." At 2:53 7DA had this at 6ZO, whence it moved via 6ZM, 6ZH, and from there direct to 9WU in a splendid jump at 3:35, thence to 9ZN at 3:50. 9ZN started with 2RK with it, but the latter having QRM and 1TS (close to 1AW) having copied it, 1AW told 2RK to OK it to 9ZN, which was done at 3:54. 1AW then got the message from 1TS and, 2RK working east with greater ease than 1AW, gave it to 2RK at 3:57. This was a pretty late hour, and 1CK had hung up. 1ES was heard for a moment at 1AW, but ND at 2RK. At 4:09 2RK raised 1JBT, who said he would QSR, and about 4:14 he

trying to get it from 5ZP, and 9LR, off schedule, trying to put it thru' to some 6. Finally 5ZA got it thru a lull in the din at 1:45, passed it to 6IG at 1:49, and from there on its record is obscure, altho it got thru OK. Actually moved via: 1AW-2JU-8ZW-5YH(?)-5ZP-5ZA-6IG-???

6EN gave the reply to 5ZA about 2:20, reading: "Transcon 16 reply nr 2, Los Angeles, to Newton C. Brainard, Hartford, Conn. Hearty congratulations on the success of the transcontinental test.—M. P. Snyder, Mayor, Los Angeles." From 5ZA this went to 5YH, then to 5XA at 2:29. 5XA endeavored to give it to 4AG and the latter promptly got all of it but the signature. Then began a real battle. 4AG asked for repeat of the signature be-



It's ever thus on Transcon Nites.

had 1JBT's QSL for it. It seems never to have gone past 1JBT, however, and 2RK finally handed it to Portland the following night. Actually moved via: 7DA-6ZO-6ZM - 6ZH-9WU-9ZN-1TS-1AW-2RK-1JBT —, but uncompleted and counted a failure.

No. 2. Eastern Standard Time. 1AW had the following: "Transcon 16 msg nr 2, Hartford, to His Honor the Mayor of Los Angeles, Cal. Mayor Newton C. Brainard of Hartford sends greetings to yourself and city by transcontinental wireless test from Conn. to Calif. Kindly acknowledge.—Hartford Courant." 1AW gave this to 2JU at 1:07, and the latter started promptly to 3DH. 3DH had QRM, but later, picking up the message, gave it to 8ZY at 1:20, whence it went to 9KV at 1:25, and from there apparently to 9LR. Meanwhile 8ZW had copied it from 2JU and gave it to 4AG at 1:17. 4AG tried to give it to 5YH, but at 1:25 the latter told 4AG it was OK at 5ZP, whether copied direct or relayed via 5YH it does not yet appear. Then began a QRM endurance contest between 5ZA,

cause of QRM from 2RK. 5XA obliged, but again 2RK QRM. 2RK was working on the other Transcons all this while, but the synchronism was perfect, and a dozen times in a row he unwittingly busted 4AG on the sig from 5XA. Poor old Pope; we feel sorry for his hard luck. He tried like a good man and it wasn't his fault. In fact, 5XA was repeating each letter in the signature ten times to him after the message was OK in Hartford. 4AG was heard to say in supreme disgust: "By Heck worst QRM I ever hr'd in ten years u sa sig M P Snyder? Cum agn name only name only 5XA de 4AG K", and again, "Looks like luck is agnst my ever getting tt clear of QRM pse send name of mayor abt ten times and maybe cn get it btn QRM." But it was no soap, for 8ZL had copied it from 5XA and called 1AW with it at 3:05. 1AW had QRM too, but got most of it; and 8ZW came in and repeated it to him, making complete copy at 1AW at 3:13. Actually moved via: 6EN-5ZA-5YH-5XA-8ZL-8ZW-1AW.

Total elapsed time, 2 hours, 8mins.

No. 3. Pacific Standard Time. At 9:59 6ZE gave 6ZO the following: "Transcon 15 msg nr 3, San Francisco, to Boston Globe, Boston, Mass. Wireless now links Golden Gate and Plymouth Rock; greetings.—San Francisco Chronicle." 6ZA is the man who shoved this one thru, to 5ZA, from whence it moved to 9LR about 10:10, and so to 9ZN about 10:12. From that time on until 10:30 9ZN was trying hard to dump it direct on 1AW or 2RK, but ND thru the QRM. 8ZY got it from 9ZN about 10:15 and got it as far east as 3DH, when 8ZW, who apparently had copied 9ZN, gave it to 1AW at 10:35, filling in the gaps in 1AW's copy of 9ZN's 10:30 transmission. 1AW called 1CK with it at 10:36 but 1CK advised he had copied it from 8ZW at 10:32. Actually moved via: 6ZE-6ZO-6ZA-5ZA-9LR-9ZN-8ZW-1CK.

There was another delay in getting the Boston reply started. 9ZN got impatient and wanted to know "What's matter up there—too many beans?" But at 11:37 1CK was on the reply to 2RK, who had QRM, but 1AW QSL'd and gave 2RK the missing parts, at 11:48. The message read: "Transcon 15 reply nr 3, Boston, to San Francisco Chronicle, San Francisco. Plymouth Rock returns greetings and congratulations to the Golden Gate.—Boston Globe." 2RK then developed gap trouble and was testing for several minutes, unable to operate, but fortunately 9ZN had got a complete copy from 1AW when the latter was repeating it to 2RK, and put it right thru to 9LR at 11:55. It is not clear just where it next went, but the thread is picked up at 6ZO, whence it went to 6BJ at 12:14, and to 6ZE at 12:18. Actual routing: 1CK-1AW-9ZN-9LR-???-6ZO-6BJ-6ZE.

Total elapsed time, 2 hours, 8 mins.

No. 4. Central Standard Time. This was too easy. 9WU had the following: "Transcon 15 msg nr 4, Ellendale, N. D., to Item, New Orleans. Tardy New Year's wishes from north to south—Leader." At 11:37 9WU gave this to 5BI, and 5BI tried to give it to 5YH, only to be informed that the latter had already QSR'd it to 5ZP. The reply read: "Transcon 15 reply nr 4, New Orleans, to Leader, Ellendale, N. D. We herewith return New Year's greetings from south to north.—New Orleans Item", and passed up via 5ZP to 5YH to BCO to 9JN, but was intercepted by 9WU when BCO transmitted it, at 12:04, making 27 minutes for the round trip.

Conditions were better this second night, and more of the messages got thru. There were fewer stations making QRM, but the night was marked in the east by the unusual activity of 3PU, who took the first prize of the anti-capacity condenser

as Chief CQ-er. 1AW's log shows him "in" no less than twenty times and really he seemed never to be working anyone but simply calling and having a real good time all by himself, and on a wave the breadth of which Mr. Kolster forgot to take into consideration when designing his w.k. decremter. The air was so quiet that he must have thought something was wrong with either his receiver or transmitter, and derned if he wasn't going to stick at it until he got things to working right. 2RK and 1AW finally asked 8ZW to "Tie up tt 3PU", and "WX" rolled out some great big QRT's, with the emphasis so much on the T's that they fairly bristled. Finally our friend got the idea, and, content with having been logged only some twenty odd times for QRM, retired and has not been heard since.

THIRD NIGHT—Jan. 16-17.

No. 1. Eastern Standard Time. Another long one: "Transcon 17 msg nr 1, Portland, Me., to Brother Ben L. Norden, Exalted Ruler, B. P. O. Elks, Portland, Ore. We of Portland, Me., lodge rejoice in perfection of a method of communication that so easily speeds this message across the continent and we extend hereby sincerest fraternal regards.—N. D. Colcord, Exalted Ruler." At 1:10 1FV started this from Portland to 1CK, but between direct copying and a few fill-ins from 1AW, 2RK got a copy before 1CK could offer to QSR, and was hard after 9ZN, who QSL'd at 1:24 and gave it to 9LR and 9WU. 9WU passed it to 7ZG, whence it went to 7CC at 1:45, and from there to 7ZI and 7DA in Portland, Ore., at 1:50. Actually moved: 1FV-2RK-9ZN-9WU-7ZG-7CC-7ZI-7DA.

The reply read: "Transcon 17 reply nr 1, Portland, Ore., to Exalted Ruler, Elks Lodge, Portland, Me. Message received OK Portland returns fraternal greetings.—Secretary, Portland B.P.O.E." 7DA started this at 1:55 to 7CC, who acknowledged at 1:57 and gave it to 7ZG at 2:01; thence to 9WU at 2:07, 9ZN 2:08, 2RK at 2:14, and thru to 1FV who re-ciepted for it at 2:18:30. This would have broken our transcon record by 11½ minutes, except that somewhere west of 9ZN the signature became garbled and that part of the job had to be done over. 9LR had got it straight around 2:15, and 8ZW tried hard to get it from him but it was impossible thru the QRM. 8ZY worked 9LR and got it, but before he could QSL, 8ZL started east with it, but neither of them got there because 2RK had successfully copied 9LR direct and put thru the correction in the signature to 1FV at 2:31, which time must be counted as the ending time. Reply actually moved via: 7DA-7CC-

7ZG-9WU-9ZN-2RK-1FV, and the corrected reply via ???-9LR-2RK-1FV.

Total elapsed time, 1 hour 21 mins., one minute longer than the record.

No. 2. Eastern Standard Time. A serious effect was made to break the record with this message, and it was held until Nr. 1 westbound was out of the way and the air somewhat quieted. It was short, reading: "Transcon 17 msg nr 2, Hartford, to Los Angeles Times, Los Angeles. How is Calif. weather.—Hartford Courant." 1AW started it at 1:26 but it got a bad start, as 9ZN was QRM-ing the whole east while working west on Nr. 1, and 2RK missed it. 3DH, however, QSL'd for it immediately, but didn't know what to do with it. Eventually he started it to 8ZW, who broke to 4AG immediately, with 2RK (who copied it from 3DH) calling 3BZ and the latter calling 4AG. There was quite a lot of confusion about this time, and steady QRM all over the east from 9ZN who was very loud this night, so that things looked pretty black for Nr. 2. 2RK simply was not to be left out of this relay, and gave the message to 4AG at 1:35. This was the transmission that actually saved the day, as 5YH copied 2RK direct, and succeeded in handing it to 5ZA at 1:55. (Up to this time we in the east were very dubious of the chances of this message, as it seemed all the careful plans had gone askew, but at 1:57 8ZL told 8ZW it was OK at 5ZA and this good bit of news was repeated by 2RK.) Two minutes later 5ZA had it at 6IG, and in two additional minutes it was safe at 6JD, 1:59. The routing via which this message was actually relayed to reach its destination is most unusual: 1AW-3DH-2RK-5YH-5ZA-6IG-6JD.

The reply was brief also: "Transcon 17 reply nr 2, Los Angeles, to Hartford Courant, Hartford. Raining in Los Angeles tonight.—Los Angeles Times." This seems to have left Los Angeles via 6EN, reaching 6IG about 2:10, 5ZA at 2:15, 5YH at 2:18. We don't know whether 5YH gave it to 8ZL or whether he gave it to 5ZP and was copied by 8ZL in so doing, but at any rate 8ZL called 2RK with it and got a GA at 2:22. 9ZN was so loud in the east at this time that they had to ask him to QRX, and after a repeat 2RK got it at 2:24, breaking immediately to 1AW, who QSL'd at 2:27. Actually moved via: 6EN-6IG-5ZA-5YH-8ZL-2RK-1AW

Total elapsed time, 1 hour and 1 minute, a new record!

No. 3. Pacific Standard Time. 6ZE started the following at 10:07: "Transcon 16 msg nr 3, San Francisco, to Boston Globe, Boston, Mass. Golden Gate accepts Plymouth Rock's greetings and returns best wishes for 1921 via the American Radio Relay League.—San Francisco

Chronicle." 6ZE gave this to 6ZO at 10:09, who QSR'd it to 6ZH at 10:16, whence it went to 9LR at 10:23. The record is next picked up at 9KV and we are not sure whether or not 9KV got it direct from 9LR. He gave it to 8ZY at 10:32, who handed it on to 2RK at 10:45 after again having to wait for the eastern stations to find time to take it. "One at a time", as 2RK said. 2RK called 1CK, and after a repeat, got 1CK's QSL at 10:54:30. Moved via: 6ZE-6ZO-6ZH-9LR-???-9KV-8ZY-2RK-1CK.

No reply to this message was ever started out of Boston, altho the routes were open and everybody along the line was yelling for it. Up to 1:10 Pacific Time 1CK was still reporting "no answer yet to nr 3." As no reply was returned, this attempt must be called a failure.

No. 4. Central Standard Time. 9WU started this to 9JN, finishing at 11:02. 9JN had difficulty in finding anyone to take it and finally dumped it on 9LR at 11:08. From there we have no record of it, nor at this writing have we the text of the message. 5ZP started the reply, however, at 11:21, reading: "Transcon 16 reply nr 4, New Orleans, to Leader, Ellendale. Yours of tonight received 25 very good work hope this beats that time.—New Orleans Item." 5ZP got no QSL for this, but 5BI again came to the rescue and repeated it, which was copied direct by 9WU at 11:30, making 28 minutes for the round trip. From 5BI the message moved in several jumps to 9JN, who offered it to 9WU at 11:53, only to be told that 9WU had had a copy of it for the past 23 minutes.

These valley relayers proved that the United States simply isn't big enough from north to south to provide them much of a relay, and we'll have to think up something harder for them to do next year.

Special. Eastern Standard Time. Around 2:30, while everybody was waiting for the reply to Nr. 2 to start from Boston, a scheme was hatched to try another special to the coast. The routes being open and the air quiet, the temptation was too great to resist. 1AW asked 9ZN to get all set, and word was passed along the line. At 2:49 1AW transmitted: "Transcon 17 Special, Hartford, to Bessey, 6ZK. Number two breaks record. Answer.—Schnell." 9ZN QSL'd at 2:50, 9LR QSL'd at 2:52, and got it to 6ZH at 2:58. The whole east was quiet for this record, interrupted for a few minutes when 2RK gave the preceding night's Nr. 1 to 1FV, 1JBT having been unable to QSR, or when one of the gang would pipe down some local QRM. There was a golden period in this time, from 2:56 to 3:02, when absolutely dead silence prevailed in Hartford, everybody in the eastern states straining their ears

for the reply. Meanwhile 6ZH had passed the message to 6ZO at 3:03, whence it went to 6ZE at 3:05. No reply came back, and at 3:28 9LR reported the western fellows said Bessey wasn't on, so this attempt for a record also failed.

FINAL NIGHT—Jan. 17-18.

This was the night of nights—a night foredestined to add to the laurels of our organization. The weather was not as good as on any of the three preceding transcon nights, but nevertheless pretty fair. In the eastern half of the country there were light strays, increasing as the night wore on, with "induction" trouble rather general; while west of the Rockies a bad rain storm was raging.

There is really something very theatic in the line-up for a big Transcon test. We have been interested in radio for a good many years, and we have seen a good deal of it from the amateur side, but the wonder of it never palls. There is a genuine fascination for us on any old night when we marvel of our ability to sit in a half-darkened room before a little collection of instruments, with the audions dimly glowing and hear the messages from our friends come buzzing in thru the night. How much greater the thrill, then, on this eventful night as the entire country got set for the endeavor to hang up a new speed record. Mr. Bessey had wired Headquarters during the day, requesting that the special transcon be postponed to 3 o'clock if possible, as that would be a better hour in the west. At 2 a.m. 1AW broadcasted a QST announcing that the test was postponed an hour and that several messages would be tried instead of one. 8ZW, 2RK, 8ZL and 9ZN were asked to take up and repeat this QST, and soon the news had spread to every corner of the country, being taken up and repeated in each section. Everybody was on edge for these tests, and more than one shaky fist testified to a little nervousness. Gradually the air became more quiet, with here and there a brief request to "QRX pse OM transcons", until finally not a signal was to be heard except from the leading stations who were participating in the preliminary arrangements. The great organization of the A.R.R.L. was clearing decks for action. From 3 o'clock until 4:45 not a signal was audible at 1AW when 9ZN was silent except two times when 5ZA was barely readable, yet hundreds upon hundreds of stations were QRX with eager ears, and the very air was tense.

The plan was to see that the route was open to the coast before the test started,

and 9ZN was asked to line up a route and report. 9LR stood by to assist him and 9ZN connected up OK with 5ZA, who in turn was open to 6ZA and 6JD. The line-up, then, was 1AW to 9ZN to 5ZA to 6ZA to 6ZK, and so efficient were these stations known to be and so perfect the co-operation, that it was understood from the first that it would be a high-speed job, with no such thing as waiting for a QRV—the stuff was going thru and it had to be copied. 9ZN and 1AW each had two operators, one to do the tuning only and the other to copy and transmit, and it was a pretty sure thing that nothing was going to get by these stations. With the eastern part of the country silent as the grave, for probably the first time since Marconi invented spaghetti, 9ZN was buzzing along at 30 per getting his lines laid, and finally at 3:01 he turned to 1AW and reported "All set GA."

There were five two-way messages this night, and for the purposes of this story we shall call them A, B, C, D, and E. The times are the elapsed time between the beginning of transmission at 1AW and completion of QSL for the reply by 1AW, and

all figures are in Eastern Standard Time.

(A)—All being in readiness, and getting a firm grip on his key, at exactly 3:06:30 Traffic Manager F. H. Schnell operating 1AW started the first message, which read: "Bessey 6ZK—Answer exact time you receive this—Maxim." 9ZN QSL'd at 3:07:30 and broke immediately to 5ZA, advising 1AW at 3:09:50 that it was OK at 5ZA. 5ZA did not QSR to 6ZA as scheduled, but instead gave it to 6JD. 6ZA copied it, but was unable to hear 6ZK because of the bad weather. 6JD passed it to 6ZK but the latter had already copied it from 5ZA. He replied to 6JD, which 5ZA copied direct. 9ZN QSL'd 5ZA at 3:29 and broke to 1AW with the following: "1AW—Msg recd 12:22 AM—6ZK." 1AW QSL'd this at 3:29:30. Note the speed of actual transmission of this and succeeding messages—many were clipped off at a speed around 30 w.p.m.

The routing for this message was 1AW-9ZN-5ZA-6JD-6ZK, and the reverse for the reply, and the elapsed time was exactly 23 minutes!

(B)—At 3:29:30, instantly following the QSL for (A), 1AW started another, reading "6ZK—Four above zero here how there—Maxim." 9ZN QSL'd at 3:30, and broke to 5ZA without QRV? 5ZA unfortunately was busy with 6JD and missed it, but 9ZN repeated two minutes later and

SORRY, O.M.

that this isn't the kind of story that can have illustrations. But we think you'll find it mighty interesting—it's A. R.R.L. History!

5ZA passed it on to 6JD. 9LR gave it to 6ZA at 3:37, but the storm seems to have pretty well blocked off 6ZA. At 3:52 9ZN reported to 1AW that 6JD couldn't raise Bessey, but word was sent back to persist as it was felt certain 6ZK was on. A combination of stormy weather, low A batteries, bad QRM from arcs, and failure to understand that there was to be more than one attempt, however, had caused 6ZK to go off watch. The outcome would not have been different if he had stayed on, through, as 6JD reported he was unable to hear anyone in Frisco. It being evident that it was impossible to get thru to 6ZK, the Traffic Manager requested that a terminal station be located in Los Angeles if possible, so the work could go on. 1AW did not know at that time that 6JD was handling the messages. Word came back to QRX for a message from Los Angeles, which was being secured, and soon the following came bumping thru: "1AW—Weather very warm and raining all day weather conditions have changed and can't hear anyone north—6JD." This left 6JD at 4:10 and was received by 1AW at 4:13:30. The routing of this, and of all subsequent messages, was 1AW-9ZN-5ZA-6JD-5ZA-9ZN-1AW. Message (B) is considered to have failed, as the reply did not come from the addressee.

(C)—At 4:13:45, immediately upon the QSL for (B), 1AW started another: "6JD—What time did you start msg—Maxim". 9ZN QSL'd at 4:14 and broke to 5ZA with machine-like precision. 6JD was a man after our own heart and wasted no time in formalities: he answered this and following messages right out at his head and wrote it down on paper after it had started east. His reply moved in the same manner as all the others, except that 9LR had copied him direct and was also shooting to 9ZN along with 5ZA, and at 4:20 9ZN broke to 1AW with the following: "1AW—Started ur msg at 1:10 AM—6JD." 1AW's QSL was sent at 4:20:15.

And so was established a new transcon record of SIX AND ONE-HALF MINUTES.

(D)—At 4:20:30 1AW gave 9ZN another one: "6JD—How does Calif regard prohibition—Maxim." This message went thru like the others, except that 5ZA's QSL was relayed to 9ZN by 9LR. It reached 6JD at 4:29 and he started his reply 15 seconds later: "Mr. Maxim—Calif is supposed to be dry but it is very wet here now it has been raining all day—V M Bitz". 6JD thereby proves that he has a sense of humor as well as a sweetly-working station. 1AW QSL'd 9ZN for this at 4:34. Total elapsed time, 13½ minutes.

(E)—At 4:35:15 1AW started the final

one, reading "6JD—This makes radio history what think OM—Maxim". 9ZN was right after 5ZA with it at 4:36, and it reached 6JD at 4:39:45. The boy was right there and broke out a reply which must bring loud huzzahs from the westerners: "Mr Maxim—Yes it will let the east know that there are a few amateurs in the west—6JD." It was a surprisingly short time before 9ZN was shooting this to 1AW, and the latter's QSL was sent at 4:43, making 7½ minutes for across and back.

The Traffic Manager then sent a QST from 1AW announcing the records and thanking the gang for their co-operation, the air at once burst into activity as hundreds of stations picked up and repeated the news and talked it over, and the Transcons were a thing of the past, but their memory will remain green for many a day, till it is eclipsed when we break these records even as we did the original one.

Naturally we are very jubilant over these results, the more so as they prove our contention that with real co-operation among ourselves our outfit can do anything. The performance of the A.R.R.L. in these tests is a thing of which every one of us can well be proud—it has never before been equalled in history, and it is going to be a mighty hard job to improve upon it. Perfect co-operation made it possible. In Chicago on that last night there was not one single little case of QRM, and only the perfect co-ordination of the Chicago Executive Council could have made that possible. It is a lesson to all of us. There was QRM aplenty on the other test nights, and we could publish a big list of the offenders. However, in most cases it was unintentional, but the too-frequent CQ-ers and the ivory domes thru which the dope could not percolate were shown up pretty well. Co-operation in canning QRM was shown as much as in other operating. Those operators who so willingly stood by and kept their transmitters silent are entitled to feel that they did just as much in making these tests a success as the stations who did the actual relaying—the triumph belongs to the organization.

The average speed of transmission in the messages of the last night was quite high, and often the replies would be coming back before one could believe it possible. If 1AW hadn't written out all his messages before the tests started and had them all ready to transmit, it might have been a different story. As it was it kept a fellow busy logging the times. Listen-

(Concluded on page 47)

High-Frequency Stuff

By "Breck"

Scientists will tell you that the mental condition necessary to result in a story like this is attained only by by eating molasses in one's soup or by monkeying with C.W. The last-named cause applies in this case—the writer is with the Precision Equipment Co., Cincinnati.—Editor.

IT was a scorching mid-afternoon some weeks ago in that majestic city of hills above which rise in towering silence the masts and antennae of the now widely known dispatcher of etherial jazz, 8XB. The writer had been laboring without success during the long hot hours trying to persuade "Millie Ammeter" to respect her contract with the "Plate Circuit Performers" which she had suddenly and unceremoniously jumped, leaving the entire show stranded. Getting peeved over her inexplicable and unlady-like conduct in refusing to dance the "shimmy" at the behest of "Mr. Modulator", that most persuasive young gentleman who had been her dancing partner for so long, I decided to interview her again in the morning and let it go at that.

Before calling it a day however, I decided to attune my ears to some of the passing wave trains. I cut in a receiving unit and after the usual preliminary juggling was surprised to hear an amateur on the ether with a CW transmitter sending "canned music". After listening a bit to a piece entitled "A Short Talk on Married Life", a piece which he seemed to favor very much, but which "life" I cannot see with a microscope, I became very much peeved and was going to quit the whole shebang and streak it for P.G.'s for a Christmas Sundae when all of a sudden I heard a terrific agonized roar come hurtling out of the air. Horrified and wondering at the same time what human being had the energy to emit such a bellow on a day as hot as that one was, I listened in carefully and was soon enlightened. The roar had originated at the station of the amateur who had been transmitting the music previously heard and for a moment I thought that he had gotten across the "500 jolts" of his plate current but such was not the case. Oh my no! Nothing so trifling! He was merely calling the world to inform them of the High Cost of Vacuum Tubes! Sort of a "call of the wild" as it were, inasmuch as he was in a rather wild state of mind at the time! He had burned out "annuder" tube. Of course I agreed with him that it was sure hard luck, but as I make the money to buy my daily bread through the sale of vacuum tubes, I secretly congratulated myself just as soon as I was sure that he wasn't looking, over the fact that I would be able to

sell him another the next day. Waiting to assure myself that he had not fainted from the shock, I shut down for the day and started for my home.

While trying to effect resonance and closer coupling between my absovitely empty stomach and a juicy steak which awaited me at home via one of the tortuous routes of local travel, I began to think about the high cost of vacuum tubes and the possibilities of a reduction in the price of same through the development of some simpler and less expensive form of



"I congratulated myself that I would be able to sell him nother tube the next day."

apparatus for "exhausting" them, when suddenly and without warning, I was jarred out of my reverie by the sudden, jolting, stop of the street car which hooked me in series—parallel with a half-dozen other passengers, by piling us all in a heap up in the front end. Disentangling myself from the mass of arms and legs and getting my wits together, I looked out of a window to ascertain the cause of the sudden stop and found that one of those fast disappearing noble beasts of burden, a horse, had fallen across the car tracks and lay, an inert mass, a victim of heat prostration.

While gazing on the poor victim which was moved off the tracks very shortly to permit of the car's passage, I was imbued with a most brilliant idea! An idea with possibilities so vast that their magnitude staggered me—one so brilliant that it

brought back memories of the star shells of Fritz rearing their way up, up, over the inky blackness of "No Man's Land" where they burst in a dazzling blaze of light. Yes, what is more important, an idea which would mean "jack" in the pockets of the bug and incidentally my own should it prove practical.

That evening after having converted the juicy steak previously mentioned, to ions, I spent a busy two hours at my desk working out details of the idea and then turned in tired but satisfied that the idea in question would work out O.K. in practical form and further that if so, it would mean cheap, efficient practical vacuum tubes for every bug and a collapse of the present day uncalled-for high prices prevailing.

After my usual morning shower and a hearty breakfast I streaked it for the Lab. at 8XB "toot sweet sans stoppe" and arriving took a small leather case from one of the shelves and packed therein a knife, some stout twine, a thermos bottle which I had filled with 5% grape juice at the corner drug store, and six standard vacuum tubes from which the tips had previously been broken, thus allowing the air to enter. My preparations completed I boarded a street car and hied me to the outskirts of the town to find a suitable location in which to try out the experiment I had in mind.

After about an hour's ride and a short walk from the end of the car line, I came to a large open field surrounded by a high

day and the sun was by this time blazing down with a white-hot blast which seemed to cause every living thing exposed to it to wither under the glare of its merciless heat waves.

I was by this time trembling with anticipation, for was I not to put to the test the greatest idea that had ever dawned on a radio bug since the invention of the vacuum tube? The sun was by this time beginning to have effect on me, for, coupled with my intense eagerness, the heat seemed absolutely unbearable. This was, however, exactly the kind of day I most desired to attempt the experiment I had in mind.

Opening the case, I removed the half dozen tubes from which I had previously broken the tips and laid them carefully on the ground in the full glare of the white-hot sun. Now, having reached this stage, perhaps it will be well to acquaint the reader with some of the details of my plan.

The previous evening when I had gazed on that poor horse lying across the street car tracks in an absolutely "exhausted" condition, I conceived the idea as to why in the world wouldn't it be simple to employ the same method for "exhausting" vacuum tubes, instead of resorting to the expensive and complicated procedure at present employed by the large manufacturing concerns!—that is, take a herd of vacuum tubes and simply drive them in the white-hot sun without mercy until they were exhausted! There seemed to be no reason as to why the idea shouldn't work out, and, as to obtaining the various degrees of exhaustion necessary for the different types of tubes used, why, that was the easiest part of the problem. For instance, if it was necessary to drive a tube a mile to procure the proper degree of exhaustion which would be best adaptable for use as a detector, then to procure a tube for use as an amplifier, it would only be necessary to drive it about three times as far, or a total of three miles; and in the case of exhausting transmitter tubes, the procedure would be to drive them to the limit of their endurance! Now having let the reader in on my idea, we will return to the field that I had selected as the best available location to put it to the test.

I had, as before mentioned, selected a field surrounded with a barbed wire fence and had taken the six tubes out of the case and laid them on the ground. Gazing thoughtfully upon them I came to the conclusion that it would be better to try out the experiment on one tube first, so I placed all but one back in the case. Now, it is well known that nothing except vehicles, water, one's nose or other liquidified things, can "run" without legs and



"We were traveling around the field at terrific speed."

barbed wire fence which I decided would answer my purpose very well. Managing to negotiate the fence without damage to my trousers I walked to the center of the field, took off my coat, rolled up my sleeves and then proceeded to put my idea to the test. It was a very beautiful

cover distance. I was therefore fortunate in that the vacuum tubes as are at the present time used in radio are provided with four legs, commonly termed prongs or terminals. The tube I selected I had carefully laid on the ground in the full glare of the sun and I had particularly taken care to stand it upright on the four legs. This operation completed, I began to take notice of the fact that I felt rather thirsty and I turned to the little case and took therefrom the small thermos bottle full of cold grape juice to refresh myself. I had just placed the bottle to my lips and had started to imbibe some of the delicious liquid when I was scared out of a year's growth by an agonized shriek from behind me. Shaking, I dropped the thermos bottle and spun around just in time to see the tube I had placed on the ground going across the field on a dead gallop and gaining speed every second. I started after it but soon saw that I could never in the world hope to overtake it, so I dropped panting to the ground and watched it until it disappeared in the distance.

Thanking my lucky stars that I had not taken all six of the tubes selected for the experiment from the case, I rose and made my way back to the thermos bottle, hoping against luck that there would be some of the liquid refreshment therein, for I was by this time quite thirsty, and coupled with my sprint in the hot sun after the runaway tube, I was pretty nearly all in.

Arriving, I found that there was still enough grape juice in the bottle to quench my thirst and after resting up a bit in the shade of a large tree on the edge of the field, I decided to try my luck again, resolved, however, that I would not allow the tube to have its own way as to the direction and speed to be employed. The fact that the tube had started off on its own initiative, however, clarified my mind on one subject that had been giving me some concern, i.e., whether or not it would be possible to succeed in driving the tubes at all. It being self-evident, however, that the tube had started off on its speed run without other persuasion than the terrific heat of the now noon-day sun, I banished this worry from my mind.

Taking the case which I had brought with me to the shady spot, I again proceeded to the center of the field. Taking out one of the tubes, I proceeded to fasten to it a piece of small but strong twine to hold it in check while running, for I could never hope to even reach the high speed shown by the first tube, let alone maintain it for the length of time required for the process of exhaustion. I figured that my weight tagging along on the end of the line would be sufficient to dampen its ardor for any very high speed, and further

believed that it would tend to shorten the time required, inasmuch as it would tire out the tube more quickly.

This operation completed, I carefully took the tube out of the shelter of the meagre shade cast by my body wherein I had held it to circumvent preliminary exhaustion, and placed it on its four legs on



"The usual mark of esteem—a radio mast of imposing height."

the ground, after which I fastened the other end of the line mentioned around my waist. For a time nothing happened, and then watching the tube carefully, I noticed that it had commenced to sway. The movement was barely perceptible, however, and fully five minutes more elapsed before I noticed any further change taking place. At the end of this time I was startled to note that two eyes had commenced to form on the plate of the tube. Slightly later, complete features had become visible and I noted that the eyes in particular were horrifying. They were a deep green in color and a stream of multicolored ions were shooting out in all directions from them. The mouth, which appeared hard and cruel, had begun to twitch perceptibly, and soon a very faint moaning made itself heard. By this time the eyes, which had been rolling aimlessly in various directions, had centered their attention upon me, and along with the shower of ions that were emitted in my general direction, you can believe me when I say that it took all the will power I had to keep from cutting the line and beating it back to town. The sun was by this time beginning to have a slight effect on me and I began to wonder how much longer it would be before the tube started to move, when all of a sudden, it let out the same hair-raising shriek the first one had and made a terrific leap towards yours truly! Scared? I'll say so! But not too scared to make a flying leap to one side to avoid the seemingly certain collision. The tube kept right on with an

awful jerk on the line around my waist, I was forced to follow, and I could not help but marvel at the tremendous strength which it had suddenly acquired, for I couldn't have stopped if I had wanted to and my only hope now was to keep my feet and follow, trusting that the tube would tire before I would. Fortunately, it kept to the field on the inside of the barbed wire fence, for had it decided to take off cross country as had its predecessor, I would no doubt have been billed for a through ticket to Mars or some other distant point in the boundless ether before I recovered from the effects of re-radiation due to extremely close coupling with the said wire fence. We were by this time traveling around the field at a terrific speed and I judge that that first terrible lap was covered in something less than nothing. The air was pouring from the unsealed tip with a terrific shrieking sound and I felt sure that the tube would soon feel the effects of this withdrawal and become "exhausted" ere long. After we had gone around that never-to-be-forgotten field some unknown number of times I had a good square look at the features I had previously noticed on the plate and I was gratified to note that a look of intense agony had become apparent, due, not doubt, to the terrific physical exertion put forth by the tube in its mad desire to get out of the heat of the merciless sun, and further, to lack of air, which was still being drawn out of the tube by reason of the high speed it was maintaining.

Being only human, I myself was by this time getting pretty well worn out and my head seemed to be on fire with the awful heat. I full well realized that if the tube did not slacken up or drop before long, I would be forced to sever the line and give it freedom as I could not hope to keep up the pace set for any great additional length of time. I decided therefore that I would endeavor to make six more laps, and to cut the line at the end of that time if the tube showed no signs of slackening speed. W had completed four of the six additional laps which I had decided upon as being the maximum number I would be able to endure, when suddenly without warning the tube changed its course and headed slam bang for the barbed wire fence! Realizing that I was due for disaster if I did not succeed in changing its direction, I yanked and sawed on the line in earnest endeavor to do so. However, my effort was of no avail for I might just as well have tried to check the earth's momentum for all the good it accomplished. This method being of no avail, I came to the conclusion that it was time for me to cast off the line and proceed on another course under my own power, and

I reached in my pocket for my knife to cut the line, which every moment was pulling me toward the fence and inevitable disaster.

But I was horrified to discover that the knife was not in my pocket and then it dawned upon me that I had left it with the case when I had cut off the piece of line now in use. Knowing now that my only hope lay in my succeeding in unbending the bowline around my waist, I attempted this, but glancing up I saw that even though I did succeed in accomplishing this I would be too late, for the fence loomed up scarcely ten feet distant and the tube was still going full tilt directly for it. I noted during this instant that a large number of rocks were stacked up just outside the fence at the point for which we were headed and it was at this time that the inevitable collision occurred. The tube, being very small, easily succeeded in passing beneath the lowest wire of the fence and kept onward in its mad rush while I was brought up with terrific force against same. The shock, as one can imagine, was terrific and just as I struck it, I was jarred and rocked and then lifted completely off my feet by an awful explosion! I was barely conscious enough to note the cause of the latter. The tube had evidently not noticed the rock pile and had crashed headlong into it. This collision, coupled with the high degree of suffocation reached in the mad race around the field during which a large quantity of air had been forcibly withdrawn from it, had so weakened it that, upon striking the rock pile, it had fallen exhausted, and the features previously noted on the plate appeared dull and absolutely lifeless, and further, the emission of ionic streams from the lurid green eyes had ceased. I full well realized in this last moment of semi-consciousness that the idea I had conceived was practical and it was at this instant the explosion mentioned above took place, caused no doubt by the intense atmospheric pressure exerted upon the tube, which in its highly exhausted condition it was unable to withstand. At the moment of explosion, I was hurled outward and upward away from the fence, and I lost consciousness for what must have been a period of several seconds, for I came to my senses high above the field and I realized that I was falling rapidly towards the earth and what seemed unavoidable certain death. Down and down I hurtled and the thought now uppermost in my mind was, "Oh, why did I ever think of putting a cheaper vacuum tube on the market for the amateur when I had such powerful and absolutely heartless forces to contend with." Why didn't I realize that I could not hope to control these

(Concluded on page 28)

6JD and Its Operator

“YES, it will let the east know that there are a few amateurs in the west."

So quoth Mr. Vernice M. Bitz, 6JD, Los Angeles, in one of the never-to-be-forgotten Transcons, in reply to Mr. Maxim's inquiry as to whether or not they weren't clipping it off about them with considerable hot dog, etc.

Permanent fame in A.R.R.L. affairs is Bitz's, largely because he was right on the job. Not that he didn't have the station and the ability, as he has been heard a number of times in the central states and Mrs. 8ZL was reporting him "vy QSA" during the Transcons, but when a storm on the Pacific Slope made it impossible to get the messages thru to Division Manager Bessey as scheduled and the Traffic Manager sent out word to find somebody in Los Angeles to receive the messages and answer them, Bitz was there and he goes down into history as one end of a transcontinental chain which holds a world's record.

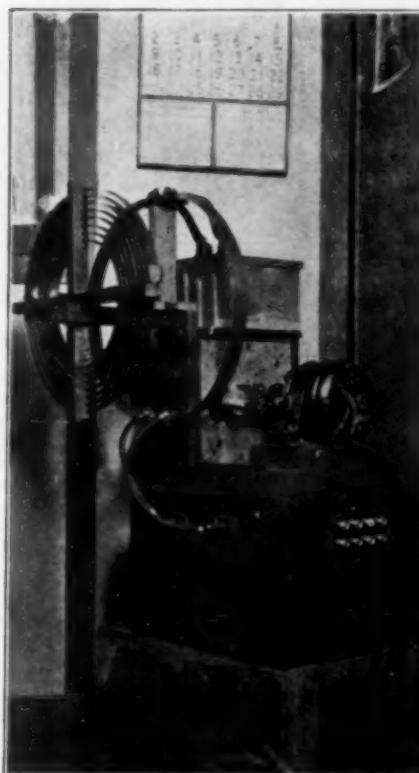


Vernice M. Bitz, 6JD

He was born in Trenton, Missouri, Oct. 19, 1892, went to school there, and while quite young developed a keen interest in electricity. At fifteen he was experiment-

ing in wireless and built his first apparatus. Moving to California shortly afterwards, he first took up telephone engineering, then motion picture electrical work, and since 1916 he has been an auto electrician. He resumed his radio experimenting in 1913, and had call letters 6UD before the war.

The present 6JD, shown in our photographs, is an interesting station. Except

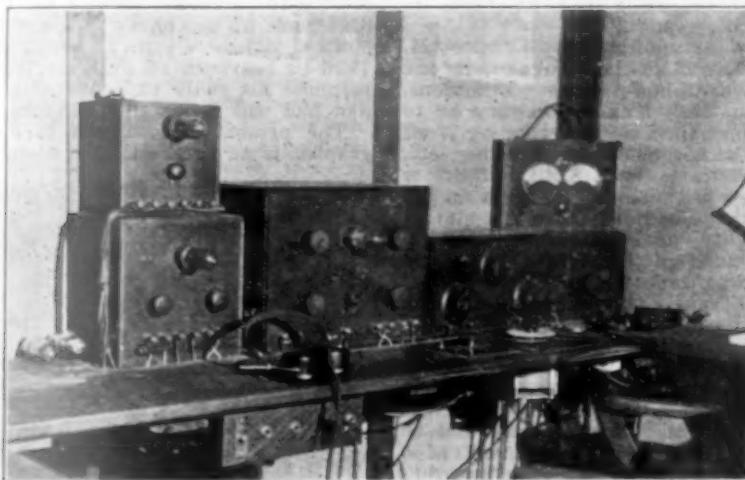


for the Dubilier condenser it is entirely home-made. The receiving set is composed of a short wave regenerative tuner, detector control cabinet, two steps of amplification, and Baldwin phones. The aerial is a T of 7 wires, 60 ft. high, 78 ft. flat-top, with the transmitter located under the center, while the ground system is composed of water pipes underground running the full length of the aerial. The antenna current, on a thermo-ammeter, is 6 amperes.

The transmitter is unusual. The arrangement is about as compact as it could be, and it certainly looks efficient. The home-made transformer is of the closed-

core non-resonant type, with the secondary wound over the primary on both legs of the core, secondary voltage 15,000, power input 1064 watts. The gap has a 6-inch

six cooling flanges, with a small fan on the motor shaft near each one to keep cool air circulating thru the flanges. The condenser has a capacity of 0.013 mfd., which



disc running 3450 r.p.m. in ball bearings, direct connected to an induction motor, and has 16 points arranged in the so-called "spark-thru" method. It is complete housed in a casing made of two plates of $\frac{1}{4}$ in. aluminum for the ends, and an 8-inch brass drum held in grooves cut in the faces of the plates. The stationary electrodes, one on each side, are set in fibre bushings with $\frac{1}{4}$ in. mica tubing over the electrodes, and each has

gives a wave of 220 meters using one turn in the primary of the oscillation transformer. Right here a novel feature is introduced: the single large primary turn is cut at both top and bottom, and the condenser inserted at the top and the gap at the bottom. In this way much of the ordinary wasted inductance in long leads is made to serve to transfer energy.

Of course there are amateurs in the west.

The Power Tubes Arrive

SEVERAL months ago we said in these columns that beyond question power tubes shortly would be available for amateur use. Altho they have been longer in appearing than was then expected, we are glad now to announce the first of the series, the Radio Corporation of America's 5-watt UV-202, with other models soon to follow.

Within a few hours after the permission to release this tube on the amateur market we were favored with a visit from our old friend Mr. H. C. Gawler, former radio inspector and now handling the amateur distribution of R.C.A. tubes, who brought one along to show us and gave us the particulars on its characteristics.

As shown in the illustration, the new tube is a somewhat larger version of the UV-200 and 201, being $2\frac{1}{4}$ " overall diameter and standing 5" high including the base. The general shape and disposition of the elements is practically

identical with that of the smaller tubes, the filament being an inverted V of tungsten. It is rated at five watts but is a big husky tube for that power and is good for 10 watts in continuous service, altho the life will be lessened by so pushing it. In fact, as much as 20 watts is possible from it, but is not recommended at all.

The normal plate voltage is 350, with 400 volts the recommended maximum. The life at 400 volts is 250 hours and up, a great improvement over previous tubes of this same general type and output. The filament current is 2.35 amperes plus or minus 6%, at 7.5 volts, being designed to operate from an 8-volt storage battery. The amplification constant is 7 to 9, and the output impedance 4000 to 6000 ohms at 350 volts. The price is \$8.00.

The base plugs into the standard receiving tube socket. The R.C.A., in-

eidentally, is bringing out a porcelain socket for these tubes, to sell at \$1.00.

This tube looks mighty good to us and



we certainly rejoice to see our greatest C.W. problem diminishing by its appear-

ance. While we have not tested the tube, we trust the General Electric Co. enough to know that it must be a good job.

Mr. Gawler also gave us some interesting data on the other styles of power bulbs which will soon be ready for distribution. The 50-watt U tube has been redesigned to increase its life to a satisfactory figure, and is promised for distribution in middle March under the type number UV-203 at a price of \$30.00 each. The P tube, the big G.E. pliotron rated at 250 watts, will likewise be put on the amateur market about April 1st at a price of about \$110. It will be known as the UV-204 and will have a life of 1000-1500 hours. Much research work has been done to secure this life, the Navy P tubes made under war-time stress having averaged around 70 hours. A full kilowatt tube, of metal, nick-named "the iron tube", is also promised by the fall at a price around two hundred dollars. These larger sizes will find very limited use in amateur affairs, but the UV's 202 and 203 will be "our meat".

Incidentally the Radio Corporation is bringing out several sets of its own in which to use these tubes—probably a D.C. set, a set using kenatrons on A.C., and a self-rectifying A.C. set. These will be purchasable in separate units so that one may buy just what is needed and nothing more, and if all goes well they will be on the market by summer.

Now how about that C.W. set?

Some Experimental Regenerative Tuners

By McMurdo Silver

THE present trend of two-hundred-meter receiver design seems to be along the lines of greater ease and simplicity of adjustment for the different circuits, with the aim of using as few variable elements as possible. In most cases, this is accomplished by reducing the wave length range, thereby doing away with inductance switches to a great extent. This method is highly commendable, but is not all that can be done with an idea of obtaining greater efficiency.

Within certain limits, the simpler the receiver the more efficient it is; and the fewer controls the greater the ease of finding an unknown transmitter, and the simpler the final tuning. But as the number of adjustments is decreased, so is the selectivity in most cases, and especially is this the case when improper fixed antenna coupling is used with an oscillating or regenerative receiver.

Below are brief descriptions of three types of short wave receivers utilizing the simplest oscillating circuits at present known, the first two having only three critical adjustments for each, and employing nothing more than the tuned plate circuits, in the first inductively tuned and in the second by means of shunt condensers. The third has a tickler coil to produce regeneration. All three are suitable for spark, CW or 'phone reception, and the wave length range will approximate 150 to 400 meters, depending upon the antenna used and slight variations in construction.

In Fig. 1 is shown a fixed-coupler variometer-tuned circuit, using only one tube, as do the others. The antenna inductance consists of thirty turns of No. 22 DCC magnet wire wound on a three-and-one-half inch tube, with a ten turn coupling coil wound in between the twentieth and

twenty-first turns. This winding then has the appearance of one coil of forty turns, as the antenna coil is stopped at the twentieth turn and jumped over for a space to the twenty-first so that the grid coupling coil may be introduced on the

tune all three circuits, and, like the first, uses fixed antenna coupling. In this case all three inductances are wound on one form, this being a three-inch tube. The antenna and grid coils consist of 35 turns each, of 20-38 Litz, with a spacing of



FIG 1

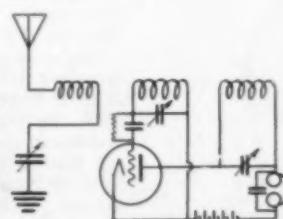


FIG 2

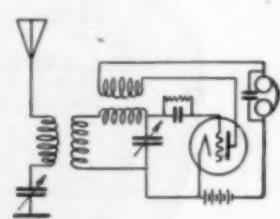


FIG 3

same tube. The antenna circuit is tuned by a series condenser of 500 to 1000 mmf., the grid and plate circuits being tuned by two variometers of the Radio-Craft or Radisco type.

In the second set, the circuit of which is given in Fig. 2, condensers are used to

1.75" between their adjacent edges. The plate coil, wound .90" away from the grid coil consists of 25 turns of the same wire. The antenna circuit is tuned by a 500 mmf. series condenser, and the grid and plate

(Concluded on page 65)

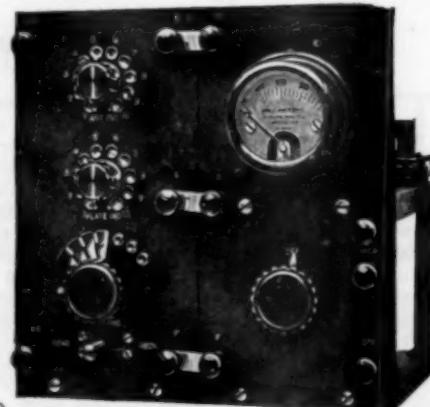
New Apparatus

A REMARKABLE radiophone, known as Type OT-3 "Midget", has been placed on the market by the DeForest Radio Tel. & Tel. Co. As shown in the cut, this set is mounted on a panel only 9" x 9", with the controls and apparatus of a typical DeForest radiophone, and with the additional advantage that tuning is done by means of tap switches.

The "Midget" radiophone is designed to work on any source of direct or alternating current supplying up to 500 volts and employs three standard transmitting tubes of the several types now on the market. It is made up in two panel sections, each being 4 1/2 x 9" in size. On the panel at the left is mounted the aerial oscillating circuit with all necessary controls. In addition a send-receive transfer key-switch is mounted near the base of the panel. The antenna and plate taps on the helix in the rear of the panel are controlled by the ten point switches shown on the face of the panel and the grid tap is controlled by a similar switch not shown.

Below the tap switches is mounted a fan type condenser switch permitting step by step variations in the series aerial condenser. This condenser is mounted in the rear, together with a plate choke coil and binding posts for both the A & B power

supply. The binding posts for the antenna and connections to the receiver, together with three posts for connection to the tube unit on the right, are mounted on the face of the panel.



On the front of the tube panel is mounted a 0-1 amp. scale hot-wire ammeter and the control knob for the filament rheostat, which is mounted in the rear. Binding posts are provided for connection to the microphone and ground. In the rear are mounted grid stopping and filament

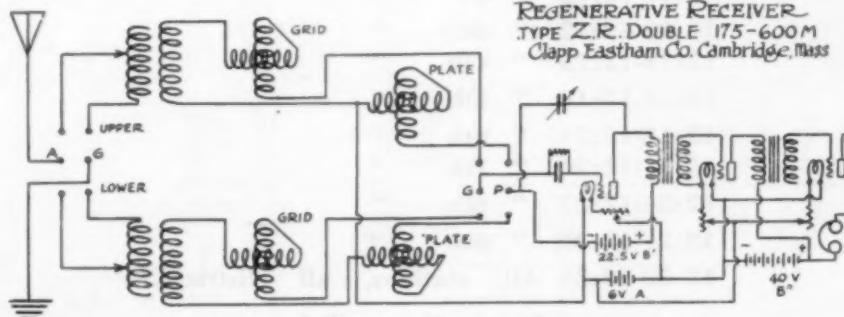
insulating condensers and the grid leak. Receptacles for three tubes are provided, and a standard type modulation transformer completes the equipment. Links connect the two panels.

With a source of 500 volts potential at least $\frac{1}{2}$ an ampere may be put into the average amateur antenna on a wavelength of 200 to 600 meters. With 100 volts "B" battery as power supply .1 to .2 of an ampere may be obtained. But one 6 volt storage battery is required, since the current for the microphone is obtained by taking a drop off the filament circuit of the tubes.

The "Midget" radiophone on laboratory test indicates that there would be no difficulty in obtaining a range of 30 miles consistently and indications are that under actual amateur service conditions, this range may be increased to several hundred miles.

As the two sections of the Midget radiophone are sold separately, the experimenter may buy either and construct the other in any way he may see fit. With the antenna circuit panel as a basis, it will be but a simple matter for the average amateur to complete the set by means of standard equipment in the nature

two complete units for tuning, with change-over switches on the front of the panel. Thus the wave length may be changed from one of two values to the other without either the loss of a moment's time or laborious tuning. A detector tube control and two stages of low frequency amplifi-



of receptacles, condensers, etc., which he may already possess.

A new receiving equipment known as type ZRFD, has recently been put on the market by the Clapp-Eastham Company, Cambridge. The fundamentals upon which it is based are more or less familiar, as every one in the radio fraternity knows and has probably used the highly efficient tuned plate and grid circuit of Major Armstrong.

The new Clapp-Eastham set comprises

cation are mounted on the panel. A variable condenser is connected across the plate of the detector tube to the negative terminal of its B battery, which materially aids in close adjustment on weak signals.

The set measures $26\frac{1}{4}'' \times 11\frac{1}{4}'' \times 10\frac{1}{4}''$, the bakelite panel being set in a polished

REGENERATIVE RECEIVER
TYPE Z.R. DOUBLE 175-600 M
Clapp Eastham Co. Cambridge, Mass

oak cabinet of $\frac{3}{4}$ " stock, with hinged cover, two locks, and a substantial handle. This, altogether, makes a compact portable receiving equipment of efficient design. The wave length range of this set is from 175 meters to 625 meters.

TRANSATLANTIC TESTS FAIL

Word has just arrived from Mr. Philip R. Coursey, London: "No signals received from States." As yet we have no details.

A.R.R.L. "CQ" Party, April 1st.

"CQ". What does it mean to you when you hear it? To most of us it means that some bird is causing unnecessary QRM. The A.R.R.L. Operating Department has declared war on "CQ" as an outgrown antique. We are going to have our last chance to get it off our hooks for ever and all time, and this CQ Party has been arranged for this purpose.

Everyone is invited to take part and open up on high power and any old speed and call "CQ" as per schedule below—and get CQ out of his system for all time. Set your watch with NAA, as the schedule is for Eastern Standard Time. Do not overlap on your time as everyone must QRX and see how many stations he can log from each district as they take their turn calling "CQ". Remember it does not make any difference whether you operate a squeak-box, a high-powered spark, a CW set, or a radiophone, this is your chance to take part in the biggest A.R.R.L. party ever held. The schedule follows:

April 1st, 1921 (night of March 31st.)

12:00-12:03 a.m. All Canadian amateurs call "CQ" (using intermediate "fm" between "CQ" and their sign).

12:03-12:06 All 1st District stations call.

12:06-12:09 " 2d " "

12:09-12:12 " 3d " "

12:12-12:15 " 4th " "

12:15-12:18 " 5th " "

12:18-12:21 " 6th " "

12:21-12:24 " 7th " "

12:24-12:27 " 8th " "

12:27-12:30 " 9th " "

12:30-12:33 All stations, all districts.

Maybe Mars will hear us.

This will be quite a relief from the strenuousness of relays and fading tests, and we point out that April Fool's Day is a particularly appropriate date for anything connected with "CQ". Anyone calling "CQ" after April 1st rates a "Hi", and deserves the key with the rubber contacts.

If you don't take part in our party it will be your fault, not ours.

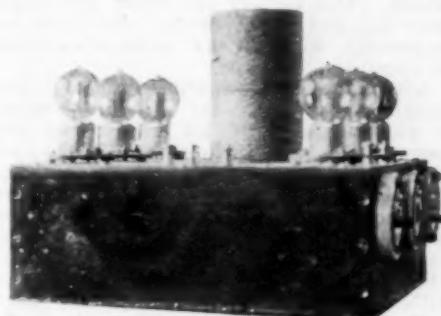
A Description of 4XB, Savannah

In our issue for November last Mr. Arthur J. Funk, Science Assistant at the Senior High School, Savannah, Ga., gave us a description of station 4XB, of which he is in charge, under the title "Some More C.W. Ideas". Important changes have been made in their equipment since then, and 4XB has held its own as one of our best C.W. stations. Mr. Funk has now favored us with complete details of the station, which our C.W. enthusiasts will find most helpful. The schematic hook-up is shown in the circuit diagram, and the photograph shows the appearance of the set-box.

4XB's aerial is an 8-wire cage 60 ft. long, elevated 30 ft. above the roof by steel masts situated on a 60 ft. building. The roof is of tin, and is used as the ground. No other grounds are used, Mr. Funk particularly pointing out that multiple grounds are highly unsatisfactory in C.W. work. The lead-in consists of four wires bound together and held away from the building by bridges.

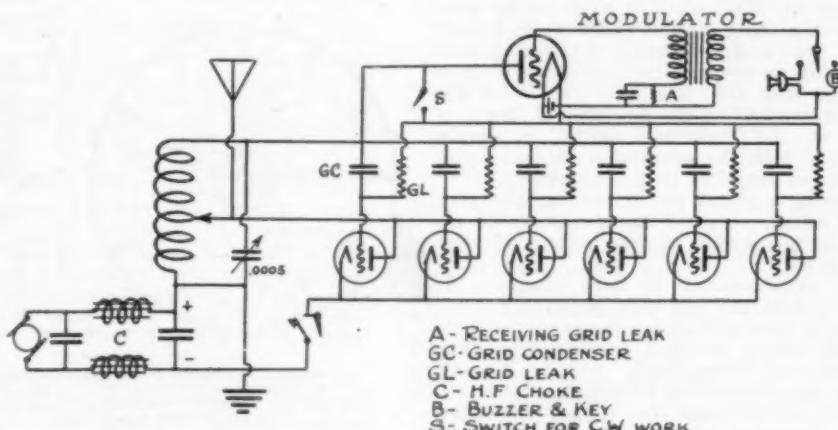
The high voltage for the plates is obtained from an old 500 volt D.C. motor driven at 2000 r.p.m. and delivering about 480 volts. The filter consists of a choke in each generator leg made of 500 turns of No. 26 D.C.C. wire on a bundle of wire nails 3 in. long and 1 in. thick, with a total capacity shunted across the generator of 6 mfd's.

pure lampblack and plugging both ends with brass plugs. The measured resistance of such a leak is about 7800 ohms. The inductance consists of 80 turns of ordinary 7/22 antenna wire on a pasteboard tube 5 in. in diameter, impregnated with paraffin, the turns separated by paraffined cord. Fifteen of the 80 turns are used in



the plate circuit, and across the extremities of the inductance a variable condenser of .0005 mfd's. maximum capacity is shunted. This condenser is absolutely essential to the working of the circuit.

The plate supply is interrupted by the key for straight C.W. but for I.C.W. and telephony a new system of modulation, devised by Mr. Funk, is used, amounting



The circuit resolves itself into a kind of a modified Hartley affair. Six VT-2's are used in parallel as oscillators. Each has its individual grid condenser, consisting of three copper plates 3 in. x 3 in. separated by thin mica. Each condenser has a grid leak, made by filling a glass tube 4 in. long and $\frac{1}{8}$ in. diameter with

in effect to an amplified-grid-leak control. In the grid leak circuit of the oscillators a modulator tube is inserted so that the leakage of the oscillators passes from its filament to its plate. It is obvious that the leakage may be completely controlled by the impressed potentials on the grid of the leakage tube, and these potentials

may be either voice or buzzer telegraph, obtained from an ordinary (Acme) modulation transformer whose primary is excited by a microphone or buzzer. The secondary of this transformer is connected to the grid and filament thru a small condenser, which is also leaked by a small receiving leak to prevent lagging on the grid. A negative bias of course is necessary on this grid, which is obtained thru the leak by getting the proper polarity on the battery which excites the primary circuit. This battery also heats the modulator filament. The entire modulator arrangement with all its accessories must be carefully insulated.

After months of experimenting and continual improvement, the antenna current of 4XB has reached 4.4 amperes on 380 meters C.W. with an input of slightly over 100 watts. We do not know the antenna resistance. The signals have been heard in almost every state east of the Rockies, and the phone has been reported from Lansing, Mich. They are able to work 2ZL, XB1 and XF1 on C.W. when QRM and QRN are heavy and audibility very poor.

Mr. Funk wishes thru QST to thank the amateurs who have kindly reported 4XB's signals, and adds that he will take pleasure in giving A.R.R.L. members any information possible regarding C.W. work.

Break-In Operation

By D. W. Richardson, 3DH

THE system to be described has been in use at 3DH all fall and works perfectly. Any station audible can break in any time and be heard. It saves endless QRM, for as soon as the receiving station gets the msg OK, a simple "R" tells the sending station to go on; and if there is QRM at the receiving station, a simple ". . ." tells the sending station and you will be convinced of its practicability.

In using a phone set, it permits two-way conversation, provided the station to be received is not within twenty meters of your sending set.

The arrangement is very simple. It means a separate one-wire antenna for receiving, a one-half or one megohm grid resistance across the grid condenser so that the bulb will "come back" quickly, a small needle gap across the terminals of the receiving set to keep the energy absorbed by the receiving antenna from sparking in the receiving set; and, most important of all, the A.C. leads around the table enclosed in conduit or suitably shielded so that there will be no hum in the receiver while the rotary is running. (If your station is remotely controlled, this last caution is not necessary.)

In regard to the receiving aerial, as stated in QST use only one wire and make

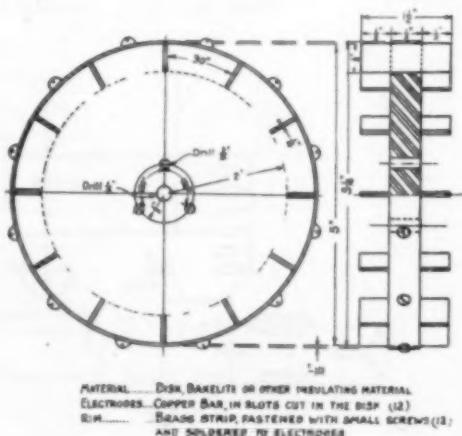
it long. Don't be afraid to put it on one of your poles, as the energy absorbed from the sending set is so small that there will be no appreciable decrease in your strength. However, keep it as far away as possible.

If You Can't Afford A High-Priced Rotary—

By Wm. E. K. Middleton, Canadian 4A9

It is very pleasant to go into an amateur radio station nowadays, especially if it is the station of a millionaire, and to gaze upon an array of beautiful Bakelite panels and about half a dozen tubes, and to be shown a transmitter of the very latest type, which probably cost a thousand or two, and which puts into the antenna an unheard-of number of amperes of continuous oscillations. Now you may visit my station if you think you would be enlightened, but I warn you that the apparatus is for the most part home-made for want of ready cash.

In short, I had to have a rotary, but the necessary evil was not forthcoming. With the aid of an enthusiastic father, a rotary was constructed—but that was before I knew anything about rotaries, and the old thing has since had to be scrapped. This is the second attempt, a few years later. I do not think I need to say anything about constructional details, for I think



that the drawing is self-explanatory. But the design has one or two advantages that are worth mentioning.

are worth mentioning.

(1) This gap possesses a combination of the good points of the "straight-through" gap, with those of the thin, wide electrode.

(2) The only serious expense is the Bakelite disk—and if you still owe your

last month's board-bill, a wood disk might do at a pinch.

I might say that this gap was constructed for a one-half KW set, but the design could very well be adapted to larger powers.

Amrad Activity

In order to help reduce QRM by the more extensive use of quenched gaps and low power, the American Radio and Research Corporation is offering free during the month of March, one Amrad $\frac{1}{4}$ K.W. Quenched Gap with every Induction Coil. This offer is particularly directed to relay men and is intended to give tangible proof of the performance of this combination in actual use.

A schedule of broadcasts has been arranged for every Wednesday and Saturday during the duration of the special offer. Most of the stations listed below will use both the quenched gap and induction coil. In addition, some of the

stations will employ an Amrad Coil for I.C.W.

The purpose of the schedule of broadcasts is simply to show the radio fraternity what the Amrad Quenched Gap and Coil will do and let the members judge for themselves the results obtained.

The stations which will send out the QST messages every Wednesday and Saturday during March follow:

	E.S.T.
1XE	4:30 p.m.
1GY	9:00 p.m.
1OJ	9:10 p.m.
1AK	9:20 p.m.
1FW	9:30 p.m.
2CX	9:40 p.m.
2PL	9:50 p.m.
3EM	8:50 p.m.
8AIW	9:10 p.m.
	C.S.T.
8ZZ	9:15 p.m.
5XG	9:30 p.m.
8HG	9:45 p.m.
9ZH	9:50 p.m.
	P.S.T.
6HI	9:30 p.m.

The Log of An Amateur at Sea

A WELL-KNOWN Brooklyn amateur who is now at sea as a commercial operator but who remains a dyed-in-the-wool ham, read our request in QST that commercial operators off duty chase down to 200 once in a while and tell us what they hear, and the following document is his log of amateurs during a three-months' trip from New York, thru the Canal, up to Vancouver. Beyond doubt it will convey first knowledge of new records to a number of AR R.L. men. Stations in every district were copied, and none was logged until its call letters were absolutely certain. The equipment was a crime, consisting of a junk "tuner" made from a Quaker Oats box, no taps, and equipped with a tickler. One stage amplification was used part of the time, but most of the reception here recorded was done on but one tube.

For various reasons the name of the operator and his vessel are not published here, but we will give the author's address to any amateur listed who may wish to communicate with him.

Dec. 12, 120 miles south New York City. NAA time. Slight QRN.

7:27 p.m. 200 calling 8JO QRK
30 1RZ calling 3UC QSA QSS
31 8JO calling 1RZ QTC? QRZ
32 1HAF PRB pse
35 3PU calling 8DV
36 8DV calling 3PU
37 2UE QRK

38 2BB QSA
43 3QW calling CQ QSA
44 2EL calling 2AJW very QSA
45 1AE calling 3PU
47 2JU "Tester pse QRT"
8:35 8SP calling 2BB very QSA
40 1OW calling 1DT QRK
50 8ZA calling 5XA QRK
55 8ZD calling 5KD

140 miles south New York City.

10:20 p.m. 2JU calling 3VV very QSA
24 1JQ calling 1AE very QSA
25 3BH very QSA
27 8ZP do.
28 8SP do.
30 2OM do.
40 1TS do.
42 1OW do.

Dec. 13, 380 miles south New York City. NAA time. QRN rather heavy.

5:30 p.m. 2HN QSA
6:44 3BZ calling 3YV QSA
47 3FG calling 3BZ QSA
7:52 5DA calling 4YB QSA
53 4YB calling 5DA very QSA
9:06 3EN calling 5DA QSA
10:25 8SP calling 9GN QSA
26 3ABC calling 4YB QSA
30 3FG QSA

400 miles south New York City, 500 miles off shore. 3VV, 5DA, 4YB, 3BZ, 3EN heard all evening QSA.

Dec. 14, 600 miles south, 300 miles off shore. NAA time. Heavy QRN.

8:50 p.m. 3EN sending QST very QSA
55 5DA calling 3EN very QSA
9:00 2HN calling 1HAA QSA
11:20 3BZ calling 3AA QSA
25 8ZE calling 3EN
55 1JAP calling QRK

12:00 2EL calling CQ very QSA 51 5BI calling 9JQ QSA
 02 2JJ QSA 54 8ZY calling 9JN QSA
 12 2BB QSA very 56 9EQ calling CQ
 21 1BM calling 3VV QSA very 57 9OE signing off QRK
 3VV very QSA and steady past 3 hours. 11:01 8EC signing off QRK
 2JJ QSA and steady as at Brooklyn. 05 9UU calling 9EQ QRK

Dec. 15, 900 miles south, 300 miles off Key West, QRN medium.

6:10 p.m. 2HN QSA 20 miles north of San Salvador

31 2JU calling 2RK very QSA 5:45 p.m. Heard somebody calling a 9. QRN very heavy

33 8SP working DX QSA 20 Hear at least six amateurs, but QRN. It is preventing the making of a lot of records

57 2ZM QSA 10:00 Static worse; impossible to read anything

7:12 1BM QSA 11:00 Dec. 20, 50 miles south Balboa. NAA time.

14 2DA QRK 20 Dec. 21, 300 miles northwest Balboa, off Central America.

15 3AHK calling 2DA, very QSA 20 Not an amateur heard all evening. QRN still raising hob. (Later: High voltage batteries were dead and didn't know it.)

20 1RZ QSA 10:00 Dec. 22, 560 miles northwest Balboa, 100 miles off short. NAA time.

35 KQG and 2XJ4 steady and QSA on phone. 6:45 p.m. Several amateurs, and still broad daylight. But QRN bad.

20 miles north of San Salvador 7:00 Hear several hams now but QRN. Still daylight.

8:46 p.m. 2RM? 25 UC working US QSA very (QRA?)

55 3EN calling 2RM QSA 11:00 2EL very QSA, audible 2 feet from phones, but QRN breaks him up. No QSS at all.

9:15 NSF calling 8ZN very QSA 35 2EL audible with phones on table.

45 2HN QRK 37 2EL again. Louder than I get him in Brooklyn.

11:17 2JU very QSA and steady. 45 9BW? Uncertain, QRN so bad. Low rotary.

48 8XK calling 2XX, very very QSA on 10:20 Lots of amateurs going but none loud enough to read thru QRN, which is audible all over room. Darn Shame, I calls it!

buzzer, generator hum audible 11:00 Dec. 23, 850 miles northwest Balboa, 120 miles off Champerico, Guatemala.

52 NSF on fone QSA calling 3AAE 7:05 p.m. 5JA calling some 5. Daylight. QRN medium

55 Many 8's and 9's but QRN very bad. 12 5CA asking 5ZS QTC QRK

7:01 2ARY QRK 15 5ZK calling 5EO QSA

30 3VV very QSA 16 5CA calling 5EO "Glad to hear u agn OM"

31 2ARY very QSA 20 5EO calling CQ Audible with fones on table

35 8TT calling CQ QSA 10:07 9JQ signing off QRK

55 3VV QSA like local 20 8ZY calling 9ZN QSA FB

2JU the same 30 9EE calling CQ very QSA. Peculiar up and down note

57 2FG QSA 33 9EE calling 8LQ "GA" Audible 2 feet from fones.

7:01 "Percy Smith now living in..." 37 5HL signing off very QSA

09 2DN signing off to 2JU 40 9XM calling 9XL very QSA

13 2JU audible foot from fones 46 5FL talking to 5HL very QSA slight QSS "WL QRN nw so write card OM merri xmas to u es urs"

16 Many 8's, 3's and 2's going but cant read thru ORN 50 9XM saying "QSY 400 nw"

11:00 Dec. 17, 500 miles north of NAX, Colon, using 1 step amplification 9EE again with that phoney swinging note.

7:15 p.m. Static very bad. No amateurs heard. 9ZC QSA

9:00 Several amateurs going but can't read. 11:00 9JN very QSA. Talking about sig of some msg.

20 3EP calling CQ. 500 cycle note. QSA. 41 8ZV calling 9HM very QSA

Dec. 18, 200 miles north of Colon. 44 9KV talking to 9HG very QSA

6:20 p.m. Static very bad. Hear a 25 cycle rotary. 47 5EJ talking to 5AO QSA

7:00 No use. Static 15 feet from fones. 48 5AO calling 5EJ very QSA

9:11 3EP calling 8BP QSA 49 5AO on msg to 5EJ "to Miss Fannie Daniel Health Office Capitol Bldg Asn. Xmas greetings" etc. Audible 4 feet from fones.

17 8ZR QRK. QRN decreasing 50 5FL talking to 5JA very QSA

23 8ZR calling 3EP QRK 12:04 a.m. 5JA talking to 5FL very QSA

50 9AW signing off QSA 12:05 1BM talking to 2GM very QSA, audible 1 foot from fones. "QSS QSS QRN bad OM QRU nil nw"

10:38 9HE signing off QSA 13 57A calling with double-speed key. QRK

39 8ZZ calling 9LQ 15 9KV talking to 5YH. QSA

40 9HR again QSA 17 9ZQ signing off

45 Hear two amateurs using straight gaps 20 1BM calling 1TS. Audible 6 inches from fones.

47 5BI calling 8ZD QSA on straight gap! 11:00 Dec. 29, 350 miles south Los Angeles, Calif. NAA time.

11:22 9AWG calling 9EQ 41 (Continued on page 28.)

23 8XK on buzzer 44

24 9AWG calling CQ very QSA 45

37 2ZM calling NV very QSA no QSS 46

40 5HL signing off QSA 47

45 QRN almost nil now 48

50 A whole mob of 8's and 9's going but some yap sending PX on 300! 49

Dec. 19, anchored in Colon, Panama. NAA time. 50 5AO on msg to 5EJ "to Miss Fannie Daniel Health Office Capitol Bldg Asn. Xmas greetings" etc. Audible 4 feet from fones.

6:30 Hear some amateur but ND thru QRN 55 5FL talking to 5JA very QSA

9:59 2EL calling 1HAA QRK (msg) 56 5JA talking to 5FL very QSA

10:00 Several 8's—QRN very bad. 57 1BM talking to 2GM very QSA, audible 1 foot from fones. "QSS QSS QRN bad OM QRU nil nw"

08 2EL again, audible 6 inches from fones. 58 57A calling with double-speed key. QRK

15 2EL a foot from fones now but QRN terrible 59 9KV talking to 5YH. QSA

16 Heard a Grebe gap, almost certain it was 1HAA. very QRZ 60 9ZQ signing off

17 9JN calling CQ QSA 20 1BM calling 1TS. Audible 6 inches from fones.

24 3EN calling 2JU QRK 11:00 Dec. 29, 350 miles south Los Angeles, Calif. NAA time.

25 9AEQ signing off 41 (Continued on page 28.)

26 2EL calling 1HAA 42

35 5BI using straight gap QRK 43

39 8DR calling 3GO QRK 44

44 5HL QSA 45

46 9JN calling 9FG 46

47 4XB QSA 500 cycle note 47

The Log of an Amateur at Sea.

(Continued from Page 26.)

Dec. 24, 1100 miles northwest Balboa, 200 miles off Mexico. NAA time.

7:30 p.m. 5EO sending QST QSA
 40 9AEG signing off QRK
 58 5JI QRK
 8:00 5ZX sending time and QST very very QSA
 02 5JE calling 5ZS very QSA
 05 5JE calling 5ZS audible all over room
 30 5CH calling 5ER very QSA
 40 2ZM signing off QSA
 48 8ZY signing off QRK very
 48 5ZT calling CQ QSA
 49 5XB signing off very QSA
 57 8ZY signing off QSA
 59 5ZC signing off QSA
 11:20 8ZY talking to some 3, think 3KM, QRK
 22 5BI very QRK
 24 9AEG talking to 5HL, very QSA
 30 8ZE calling come 8, QRZ
 31 9OE calling CQ QRK
 35 BCO signing off to 4AG QSA
 41 9HI calling 9OE QSA
 43 5JA QSA

Dec. 25, off Tequepa Bay, Mexico (Pacific Coast). NAA time.

7:30 p.m. 5ZF calling 5ZC very strong
 45 5TD calling CQ very strong
 56 5JE calling 5DQ "Wanted to wish you a Merry Xmas" Strong
 8:15 5ZN calling CQ very strong
 30 Heavy static from storm—now impossible to copy anything.

Dec. 26, 50 miles north Pt. Telmo, Mexico.

7:44 p.m. 5BI signing off to 5FA, very strong using rotary
 8:00 9AEG calling 5YH QSA
 11 5JX talking to 5BI
 15 Heavy static—no more tonight

Dec. 27, 60 miles south Cape San Lucas, Lower California.

8:08 p.m. 5ZC calling QST with weather report, very QSA
 15 Just heard a 2 station but QRN busted him.
 29 5ZX just finished QST, very QSA and no QSS
 24 5BI calling 5ZF QSA
 26 Hear a 2 station—sounds very much like 2E1.
 57 5BI calling 5ZC very QSA
 9:12 6AAK signing off QSA (First 6)
 14 6IG calling 9LR very QSA, audible all over room.
 10:57 5ZA calling 6IF very QSA

Dec. 28, off Magdalena Bay, Lower Calif. NAA time.

8:00 p.m. 5BI signing off QSA
 10:30 5ZA calling 5AC very QSA
 31 6ABP QRK
 11:00 5ZJ very QSA
 12:25 a.m. 6ZN very QSA
 56 6ER very QSA
 1:06 5ZC very QSA all evening

(Concluded on page 64.)

High Frequency Stuff

(Concluded from Page 16)

forces with their unlimited resources of power! A comforting thought now entered my mind as the earth seemed to move rapidly toward me and that was the fact that if my remains were discovered by the searching party that no doubt would be sent out they would be able to deduce from perusal of the material still remain-

ing in the case that I had been engaged in mortal combat with the super-powerful forces previously mentioned and that my objective had been good tubes at a fair price, within the reach of all, with unlimited freedom as to the use they were to be put to. No doubt they would erect over my grave the usual mark of esteem awarded all experimenters for exceptional effort exerted in the promotion of Amateur Radio, i.e., a radio mast of imposing height with the words,

HERE OSCILLATES BRECK
 May he ever be free from QRM
 and female operators
 and
 May his decrement never exceed

.2

My heart swelled with pride at the thought and at this instant I struck the earth and knew no more.

After what seemed an interminable length of time I returned to consciousness with the realization that my head seemed about to burst and after my blurred vision had somewhat cleared itself, I came to the conclusion that it was the blue painted ceiling of the radio room at 8XB at which I was gazing, and not the blue sky above that open field. I further realized that I lay sprawled flat on my back on the floor with what had been a perfectly good pair of Baldwins lying in a dozen pieces alongside of me. Staggering to my feet I felt strangely weak and helpless as I managed to right the operator's chair which I found in one corner under the table containing the instruments and flop into it. After a few minutes I began to feel better and I then became conscious of a strange burning sensation which seemed to center in each of my hands. Gazing down on them I saw that the fingers of each were blackened, and then suddenly everything became clear to me.

While engaged in working on the radio telephone, the heat of the afternoon had evidently taken effect on me and I must have fallen asleep with my head lying upon my arms on the operating desk. I had no doubt left the motor generator running which supplied 1500 volts D.C. to the plate circuit of the phone, and in some manner while asleep, I must have come in contact with the 1500 volt terminals of the panel and received a terrific jolt which threw me backwards off the chair and at the same time rendered me unconscious. Ah, yes; it was all clear now.

Half an hour later I rose from the chair and nursing a lump on the back of my head that felt as big as College Hill, slipped on my coat and left for home, thanking my lucky stars that it was only a dream.



Downward, Ho!

Did it ever occur to you that the average wave length used today by general amateur stations is much what it should be if the law said that no amateur should use a wave length *less* than 200 meters? Think about that for a minute, and then reflect that what the law says is that no general amateur station shall use a wave length *in excess* of 200 meters. See the difference? This radio law is the document that permits our existence, and its provisions must be obeyed.

Much improvement has resulted in this situation since we started talking on the subject in QST but there are many of you men who still think it's the other fellow to whom we are talking. Honestly now, what's *your* wave length? If you don't know, it is your business to find out. If it's over 200 meters you should cut it down—yes, stop operation until you get it fixed.

We can write editorials on this topic "until our mind changes" and do no good unless we succeed in impressing each individual reader with the idea that it is really essential for the good of Amateur Radio that each individual do *his* part and make sure that *his* wave length is not over 200 meters. That is the idea, fellows: each of you must take this thing to heart and become aware that the A.R.R.L. considers no amateur a good one who uses in excess of 200 meters on a general amateur license.

It's the order of the day, O.M.

The Berries!

THE way C.W. is making good all over the country brings joy to our heart. The skeptics are one by one beginning half-heartedly to tinker with it, and once they do there is another spark set for sale, for the quiet little C.W. set has a way of putting over the traffic that endears one to it immediately. We like to talk about the advantages of C.W.—it's really an inexhaustible theme, the energy

is all on one wave length, the decrement is zero, the heterodyne amplification is enormous, and the signal-stray ratio is vastly improved by oscillating reception. It's not difficult, and mile-for-mile it's no more expensive than the spark. The objections to it, where they exist, are mostly sentimentalism, and will not stand the searchlight of scientific progress. Fellows, the good old spark is going, and we might as well get ready for it, because C.W. is working rings around it every night in the year.

Do you know that there is a little world of C.W. stations entirely apart from your own, bumping across traffic every night without your knowledge and regardless of the spark QRM under its nose? There is. Just for an example consider 1AE, 2ZL, 8ZV, 8ZG, 8YG, 9XI and 9XM, who nightly on about 350 meters are hard at it on straight C.W. and getting thru where either QRM or natural conditions have always made spark work extremely difficult. 2ZL with his two U tubes and 3.75 amperes in the aerial has been copied QSA at 5ZA, and works Texas stations like a dream. The other stations are not nearly as powerful—ten watts, most of them—yet any of the bunch will completely outclass a 1 KW spark set in actual work. The reason you haven't heard these stations, and the many others like them scattered all over the country, is that it seems to take a C.W. man to listen for a C.W. signal, so that we find them working among themselves—and leaving the rest of us behind. In the vernacular of the day, straight C.W. is "the berries".

If you would like a practical demonstration of what C.W. is doing, start your bulb oscillating and carefully run over the tunes up to 375 meters. There's business there you never dreamed of, and when you hear how easily it slips thru we'll wager you too will want in on the new game.

A word to the C.W. men! Sign once in a while. Remember that the west coast fellows have listening hours and eastern C.W. signals are getting thru but they don't know who you are because, they say,

you don't sign very often. Try it—but watch out for the flock of postal cards.

Progress

AN interesting piece of radio literature has found its way into our cubbyhole—the 1912 official call list of the Chicago Wireless Association. It was printed only nine years ago, but that takes it back to *Ye Goode Olde Days* in Amateur Radio, because, as we have often said, things have a way of moving fast in this game of ours.

When this book was printed the Radio Act of 1912 had not been passed and two-letter calls were used, with the Morse code the standard instead of Continental. The rudiments of the now famous Chicago Plan are evident in the association's old "Rules," and some of their agreements are golden today. For instance: "Contention for the use of the air is a waste of time and is prohibited;" "Avoid all unnecessary repetitions, such as 'OM,' 'GE,' 'HI,' etc.;" and this one: "Members of the Association are requested to use tolerance and forbearance in their dealings with others." Others of the rules, however, are an interesting commentary on the development of Citizen Radio.

Rule No. 22 says that members must not call government or commercial stations. Most of the present day amateurs have no idea that such a thing was ever done, but it was. And get this, you men: "Rule No. 10—Members will not use transmitting apparatus after 11:00 p. m." Shades of the original Boiled Owl! and today DX does not start in Chicago until 11!

Many familiar names are among the old list, among which are W. J. McGuffage, old "MS" and the association's Chief Operator with the maximum DX record of those days of 90 miles; "HD," Mr. A. A. Howard; "RO," Roy Haynes; "GX," F. H. Schnell, our Traffic Manager of today; "PF," P. S. Pfeifer; and believe it or not, the entry that made us think of the wonderful development separating that day and this: "RM—R. Mathews, 5030 Kenmore Avenue; miles worked 4."

Yes, it must be true—it's our own Mat-ty of 9ZN. Can you imagine a 9ZN with a proud record of 4 miles? Don't you believe us when we say that we have progressed?

Think of 9ZN of today, with a record of close to 3,000 miles and copied innumerable times in every state in the Union; go back just six weeks and recall the Transcons, with that same "R. Mathews" at his key in Chicago spanning the magnificent distance to Roswell, New Mexico, as easily as tho it were a small fraction of his original four miles, and making possible our Transcontinental record of 6½ minutes.

Progress? Yes! And "Ever Onward" is the rule in our organization. The technique of radio has made such rapid strides and is even now experiencing such swift improvements that the most sanguine among us dare not prophesy. Nine years from now—?

The Radio Ladies

WE have just had our lunch, and it was a good one, and while our coat is still on, our shoes bright and our general appearance somewhat amplified, we will say what we have on our editorial chest about our new sisters—The Radio Ladies.

Whether it was the World War, or Woman Suffrage or Sun Spots that caused it, we do not pretend to know, but, whatever it was, the fair sex are sure coming along. One of the last things we expected to take place was the advent of Woman in Amateur Radio. There seem to be so many things in amateur radio that are foreign to Women. It causes us to pause and gasp, for example, to consider the spectacle of a woman digging in a ground system, or operating a blow torch, or ascending to the ridgepole of a house by means of a ladder which is never quite long nor steady enough. We question things, when we think of a woman or girl upending a sixty foot mast pieced together from very doubtful lengths of two by four. And when it comes to sitting beside a rotary gap which is snorting blue fire and emitting ear splitting shrieks, we cannot refrain from wondering. But these things have actually come to pass. Our fair sisters are stringing wires, subscribing for QST, framing membership certificates, putting on A.R.R.L. pins, and climbing trees and ridgepoles. Pretty soon they will be sniffing around closed and open circuits, asking leading questions about fundamental wave lengths, making discoveries in the field of resonance, and recording objections to certain fists. It is only a matter of time before one of them will horn in and show that some old-timer brother has all along been working on simple regeneration only when he thought he had one step amplification. Then we of the sterner stuff will wake up to the fact that time has wrought great and wonderful changes. Only the other day we read that some authority on automobile road traffic had stated that the figures proved that the average woman automobile driver had more judgment, lost her head less, and caused fewer accidents and observed the traffic laws better than the average male driver. This strikes us as going some, but even it is not up to the record that

(Concluded on page 64)

THE OPERATING DEPARTMENT

F. H. SCHNELL, 1MO
61 Waverly Bldg., Hartford, Conn.
TRAFFIC MANAGER



Of course the most important thing this month is the Transcons. We are all entitled to feel proud of our achievement, and the Traffic Manager wishes to express his cordial thanks to all amateurs for the splendid co-operation which made these results possible. As the Transcons are covered in detail in the leading article in this QST, no further mention of them will be made here.

Reports

Several very good reports were not included in last month's issue, simply because they were not in this office on the FIRST of the month. Our forms close on the first without fail. If you desire that your division be represented in QST, you must assist your Division Manager by getting your reports in to him on time so that he has time to compile the complete report for the Division.

Total Messages

The number of reported messages handled in all divisions in January totals 8084. This is not a complete count of all traffic by any means. The total for all divisions should be somewhere near 25000. It goes without saying that hundreds of stations do not send in their traffic reports and it is known that a great many of these handle more than 100 messages per month. For the benefit of your division fellows, forward your traffic report to your Division Manager, and let us see if we can reach the above total. Do it every month and our total messages will grow. The main reason why the Central and Mid-West Divisions have such a large total is because almost every man in the division sends in his report, and if everyone did the same in the other divisions the reports would be far better and more complete.

Honor Position

Following each division report will be found the total number of messages handled in each division, and the name of the owner of the busiest station or the individual station handling the most messages. In the introduction of the Operating Department Report, we will have an honor position each month, given to the station that has handled the most messages during the reported month. The honor position this month goes to

January, 1921
MR. R. H. G. MATHEWS
9ZN, Central Division
370 MESSAGES

December, 1920
MR. W. S. TAYLOR
9CA, Central Division
386 MESSAGES

Now if you fellows get on the job, 9ZN is going to be hard pressed to hold that position. Last month 8ZL was so close that the only reason 9ZN was able to hold out, was that he sat up on January 20th and handled 63 messages. Quite a few, but if he can do it, some of the other Boiled Owls can do the same or better. If you want the honor position you have got to move traffic.

Improvement in Southern Sections

Our little SOS for stations in the southeastern part of the United States bore fruit. We located some stations and the outlook is more than bright. Mr. H. C. Wheat, Gaffney, S.C., is going to have a real transmitter second to none. Plans are now under way for the installation of same. This is a most joyful piece of information and this station will span the gap from Florida to the north. Just the place for a good station, and one that can be kept busy all the time.

Conditions

The Transcon Tests revealed what could be done if we had no QRM. Just glance at the Calls Heard and the station reports. For the first time in the history of the A. R. R. L. all districts have been heard, and by more than one station. Perhaps there are others, if so, send in your records. We cannot hope to absolutely cut out all QRM, but it is quite possible that much of it can be reduced by a little foresight on the part of a great many stations. The international abbreviation "QTC?" is being run to the ground. Some stations still persist in calling a station or "CQ" for at least nine times and signing nine. It is the same old story. How many of you have listened to this same thing and noted that just

before the station signed the signals faded out? It is a fact that many more stations would do better work if they called a lesser number of times and signed the same way. Follow the radio regulations fellows, call three times and sign three times.

With all the QRM, traffic has been moving regularly in every direction and more consistently since the men have started in real earnest to deliver messages. The monthly reports follow:

DELTA DIVISION
J. M. Clayton, Manager

It is gratifying to note the amount of co-operation the members of this Division gave in the recent transcontinental relays, and it is due mainly to this that the messages through this division were forwarded, in such good time. Quite naturally ALL the stations can't be in on all the transcontinental relays, but all can co-operate and the Division Manager is especially proud of the stations in the division for their hearty co-operation in this matter.

Especially good work was done by 5YH and 5ZP in the relays. But the rest of the fellows have shared in the glory of it all as much as the transmitters, for without some control of QRM the messages would never have gotten through.

It is hoped shortly that there will be several medium powered CW stations in the division to help solve the problem of good traffic work. Quite a number of the northern and eastern CW stations came through in fine shape almost all over the division and it is needed here to help relieve the QRM.

Mr. Hutcheson, 5DA, Superintendent of Tennessee, reports prospects at Knoxville, Memphis, Chattanooga and Cleveland. 5ER at Nashville is getting through in fine shape and is handling traffic for his state. 5ER and 5DA are the only regulars in Tennessee. 5DA handles traffic north and east but is having a very meagre success with southern stations. Mr. Hutcheson promises steady watches at 5DA.

Mr. Barrow, 5EA, District Superintendent of Louisiana, reports all Louisiana blooming. The following stations in Louisiana are doing DX work now: 5ZP, 5ZK, 5EA, 5ZS and 5JE. Mr. Barrow expects several additions to the above list within the next month.

Willie Anthony, 5ZS, City Manager of Shreveport, is the speed king of the district. The quickness with which Willie has been getting traffic for Shreveport and getting the answers back has been highly appreciated by all. Mr. Guy Hanes has consolidated with Anthony. The Division Manager had the pleasure of meeting An-

THONY during December, and is certainly pleased at the equipment 5ZS boasts of.

Mr. Barrow has at last discarded that quenched gap and with the new rotary pounds in in great shape. He is centrally located and is doing excellent work. The quickness with which 5EA clears the hook is remarkable. It is reported that the pin upon which he keeps his msgs is warm always from the continual taking off and putting on of traffic.

Mr. Francis L. Pullen, City Manager of Houma, Louisiana, has made several changes in his station. Signals much better than usual and he has been doing some very nice work with the new arrangement.

Mr. Greenlaw, the Traffic Chief of the Division, has been working up a scheme for handling messages throughout the division. 5ZK comes in great at Little Rock, and he has handled considerable traffic with 5JD.

New Orleans has nothing new to report. The Division Manager had the pleasure of meeting the biggest part of New Orleans, deBen, 5ZP, while 5ZP was on his way to the Midwest Convention. It is a pleasure to listen to the perfect code that goes forth from the hand of ZP and our friend 5YH. The New Orleans QRM continues to multiply by the Ford-full, and 5ZP continues to bat 'em out as much as ever.

At Little Rock, 5JD, Kinsolving, has been doing some very good traffic handling. With his help and with 5YH the traffic goes through this part of the division in fine shape. 5JD is a new man at the game but he handles traffic like an old timer.

5YH has been doing some exceptionally fine work during the month and continues to be a main link in the traffic chain throughout this section.

The Division Manager has been minus a sending station for over a month, but is going to get it back as soon as a new pole can be put up. He also contemplates installing a C.W. set very shortly. In the meantime he hopes to catch up on his Division correspondence and take an occasional trick at 5YH, through the courtesy of Lieut. Baldwin.

It is quite important that all stations in the division send in the list of messages received and messages sent, to the Traffic Chief, 5ZK, by the 23rd of each month. Also don't forget the list of calls heard.

Total messages 470. Busiest station 5ZL —168 msgs. J. M. Clayton, 1301 Welch street, Little Rock, Ark.

EAST GULF DIVISION
E. H. Merritt, Manager.

We are very much encouraged with the "life" being shown by the Florida stations now. 4AM, 4BI, 4CB, 4DI, 4AO and 4DW are some of them being heard often,

although no traffic has been handled yet by them. If these men will co-operate with us and "discover" a few more stations, we will be able to work a relay route through to the "Cow's Tail" soon. Stations in West Palm Beach are in reliable communication with Bimini, one of the Bahama Islands, but they can't work north.

Cards were sent to all stations in the Division about the Transcons, and there was less QRM from us than from any other Division. All the fellows wrote that they would QRX, but the Florida men asked who ever heard any QRM from them anyway.

South Carolina still has only one man, 4EG. He has a good set but is unable to connect up anywhere. Are there no spark coils in the state even? Please write us if you have any kind of a set.

Georgia men are doing good work, but can't go south. There are eight Atlanta stations being heard now, but very little relay work is accomplished. Atlanta stations will not be open for DX work until after 9:00 p. m. C. S. T. Dr. Hodge, City Manager of Savannah, reports that they have three stations there working DX, with 4YB and 4BY the best. 4XB is having remarkably good results with fone and CW. 4BY wants to know if the southern men are all on vacation or if the Fading God has put his 'Woofhong' into their signals.

Superintendent McIlvaine of Alabama, 5XA, reports ND from his station yet except 5XA. The Birmingham men are forming a radio club and will get several sets working there soon. 5XA calls attention to the peculiar atmospheric conditions on January 9, 10, 11. On these nights he heard only two 9's and NO 8's, although they are usually the best. 4's were ALL good and several FLORIDA stations were worked with no QSS. The same conditions were noticed in Atlanta by 4AI and on the night of the 11th, and nearly all the QSS tests were missed.

Total Messages 100. Busiest Station 4YB—34 msgs. K. of C. Savannah, Ga.

ONTARIO DIVISION A. H. K. Russell, Manager

Traffic is moving slowly along in the Ontario Division, but is vastly improved from the earlier part of the season. Toronto has now many stations who are working easily across the border into New York and Pennsylvania, and quite a bit of traffic has gone forward through Niagara Falls and Buffalo. The installation of the various CW sets has been delayed a lot through the tube situation as delivery seems to be held up indefinitely on bulbs, particularly those from England.

A beginning has been made in eastern

Ontario to get traffic through, and Mr. W. A. Caton, of Napanee, has been appointed Manager of South-East Ontario. City managers have been appointed in Kingston and Belleville, in the persons of Mr. Orton Donnelly, 3HE, and Mr. H. R. Woodley of Belleville. Communication has been opened between Napanee and Kingston.

Southern and Southwestern Ontario report steady but not rapid progress, and Kitchener reports the erection there of a high power spark station at the High School

NORTHWESTERN DIVISION J. D. Hertz, Mgr.

Now that the Transcon tests are over we are turning our attention to the more everyday work of getting traffic through efficiently. While it was proven that a message could be gotten from one coast to the other, and an answer back the same night, it is very seldom that a regularly handled message gets through one way in twice the time.

North and south traffic gets through the Division without delay. But business destined for the east finds going much harder. The difficulty seems to lie between 7CC and 7EX or 7ZG. It is comparatively easy to get through to 7CC, or 7YA, and 7EX and 7ZG report that they have little trouble working any number of Nines. But 7EX and 7CC can't seem to hook up on account of QSS, and the same difficulty is experienced between 7CC and 7ZG. Certain nights both 7EX and 7ZG are QSA in Portland, usually both being heard the same nights. 7CC does not have this difficulty working 9EE and 9WU, but on the other hand both of these Nines are bothered by QRM.

The following stations in the western part of the Division have been taking an active interest in relay work: Seattle, 7AD, 7IU; Tacoma, 7BC and 7CE; Portland, 7BP, 7ZI, 7BR, 7DS, 7ED, 7JW, 7GA; Vancouver, 7ZJ, 7BJ, 7ZK; Silverton, 7IN, 7CW; Salem, 7BH; Eugene, 7GQ, 7HF, 7HN; Kelso, Wash., 7BV.

Dann, 7JP, at Astoria is back on the job after a month and a half vacation.

Milton Koupal, 7GQ, Eugene, Oregon, has been appointed District Superintendent for the southern part of Oregon, succeeding DeGuire. He reports that northern stations heretofore faint or inaudible are now QSA, but still very QSS. 7FB at Marshfield is QSA.

Miss Dow, 7CB, at Tacoma, reports that during the Transcon tests the entire locality was "well behaved," and no QRM was experienced. (We wish to thank the Tacoma Radio Club for the support it is giving Miss Dow in A. R. R. L. affairs.—D. M.)

Teed, at Kuna, Idaho, says that the

Martin Bros. station has been licensed under the call 7LN. Also says that 7YA is doing good work. 7FT promises to be on shortly.

Mention might be made here of the work done by 7DA and 7ZJ in connecting up with 5ZA. Both of these stations have also heard 9ZN, and on one night when 7DA gave 9ZN a call he was copied at Minonk, Ill. He has also been heard in Texas, also at 9LR. 9LR is also among the ninth district stations heard in Portland by 7ZI. 7ZJ reports hearing the following: 9EE, 9AE, 9AIG, 9WU, 9ZQ, 9OE, 9ZN and 9ZJ.

Regarding the Transcon tests, great credit is due the boys who QRX'd for the messages. There were but few cases of apparent anxiety to fill the air with noise. Credit is also due those who were lined up for the test, but who did not get a chance to prove their worth, and finally, credit is due to those who actually took part in the relaying. These were few in this division, namely 7ZG, 7CC and 7DA. All of these stations are to be complimented for their fast work under the trying conditions of poor operating weather.

Total messages 391. Busiest Station 7CC — 262 messages. Jack Woodworth, 107 Alman street, Moscow, Idaho.

DAKOTA DIVISION Boyd Phelps, Mgr.

Relaying has taken a big jump with many stations during the last few cold months and many new records have been hung up during the good weather. Stations 9WU, 9EE, 9ZC, 8Q, 9HM, 9ZT, 9XI, 9TI, 9AIG, and 9UT have been doing most of the relay work to points outside of this Division. Others "st'p out" occasionally but not consistently. 9XI and 9ZT have gone CW crazy, so temporarily 9HM has been handling most of the traffic to the Twin Cities.

Many stations have been popping up in the small towns about the Division which makes the prospects look better for daylight and summer routes. However, it is felt that there are still quite a few fellows that have sets capable of some distance who have not written in yet. Branch route appointments are being made as fast as good stations can be arranged in relay lines. Amateurs outside of the larger cities are urged to write to the Division Manager to see in what way they may help.

In the Transcon relay tests the station of Mr. Leavenworth, 9WU at Ellendale, N. D., was the star station in this Division. Prospects looked poor when plans were first started but considerable testing was done and alternate routes arranged wherever possible. The outcome is now radio history.

Mr. J. A. Gjelhaug, District Superintendent for Northern Minnesota, wishes to announce that communication is now open with Canada through his station 9ZC to 4AM at Winnipeg. It seems that our Canadian cousins are getting tired of long wave reception and are beginning to build short wave receiving sets. We have been hearing some of them for quite a while but just lately, due to the efforts of Mr. Gjelhaug we are able to connect up with them regularly and open up for relay traffic. We welcome your traffic.

ROCKY MOUNTAIN DIVISION M. S. Andelin, Mgr.

The Division Manager has made a trip through Utah and visited nearly all the DX stations of the state and is very pleased with the work done. Stations in this division have a condition to contend with that is not prevalent in any other division to our best knowledge. That is the difficulty of working stations located in the mountains. While most of the DX stations find no difficulty in working stations outside of the division and have a reliable working range of several hundred miles they experience the greatest difficulty trying to work intermountain stations. Fading signals is the greatest obstacle, then wave length changing comes next. The writer notices this particularly between Salt Lake City and Richfield stations. Stations in different localities fade out of receiving range for days at a time then come in doubly strong for a similar period. These conditions are noticeable on the short wave lengths more than on the longer ones.

This month the bulk of the traffic has been handled by 6ZA, 6ZH, 6ZM, 6JT, and 9AMB. Our western traffic goes via 6ZO, formerly 6BQ, also almost any coastal DX station. Eastern outlet is via 5ZA, 9LR, 9WU and others.

The transcon relay went through this division as scheduled but on several instances was helped out by 5ZA and 6IG. The messages went direct to either 9LR or 5ZA and were not sent via the Denver district because of inability to work those stations at that time. Mr. Kaar, Assistant Division Manager, reports favorable developments in northern Utah and is well pleased with the co-operation shown by the members in this division.

Total messages 397.

WEST GULF DIVISION Frank M. Corlett, Mgr.

To those that did not attend the Midwest Convention, you do not know what you missed. It was a great success. It was more than a pleasure to meet the many CITIZEN RADIO MEN that were there. To the St. Louis Committee I take off

my hat. They did the job in good old A. R. R. L. style.

The Transcon tests were sure a great success, because of our splendid A. R. R. L. Organization, which made it possible to send a CITIZEN RADIOGRAM from HARTFORD, CONN., to LOS ANGELES, CALIF., and GET AN ANSWER BACK within 6½ MINUTES. THINK OF IT! To the stations actually doing the work much credit is due but to the 250,000 station owners who STOOD BY and kept the air clear during these tests a still greater credit is due for they are the ones that made this record possible. The co-operation was wonderful. This is just an example of what ORGANIZATION and TEAM WORK will do.

All TRAFFIC and MONTHLY reports should cover the period from the 15th to the 15th of the month. All reports should reach the District Superintendents by the 18th of the month. Aside from a general report covering activities in your Territories or cities, your reports should include the NUMBER OF MESSAGES HANDLED by ALL STATIONS in your Territory or City. Messages received for transmission or delivery LOCALLY count as MESSAGE handled. Messages RELAYED, received and retransmitted count as TWO MESSAGES handled. Remember this in making your reports and list them so many "CITY" and so many "RELAYS." The STATION REPORTS as requested in Division Letter dated December 15th should be a separate report and forwarded along with your other monthly report to your DISTRICT SUPERINTENDENT. STATION REPORTS will be published in QST under a special department created for this purpose. To make it a success your reports are necessary.

The traffic reports this month that were received in time to include herein indicate activity throughout the entire Division which is pleasing to all of us who have endeavored to make this one of the TIP-TOP Divisions.

District Superintendent Falconi of the New Mexico District sends us a brief but interesting report on conditions throughout his District and is indicative of the effectiveness of his labors, and we desire to congratulate him thereon.

Mr. W. S. Bledsoe has been appointed Asst Dist. Supt., in charge of the El Paso Texas Territory, and through his efforts, together with those of Mr. Falconi, traffic to El Paso is now being handled via 5ZA, 5ZJ and 5XD, with clock-like regularity.

Mr. Livingood of Las Vegas reports much interest in radio in his territory and improvements in results are rapid.

It is unfortunate that there are no stations in some of the larger cities of New Mexico, and we are very interested in

getting a station going at Santa Fe, Albuquerque and Silver City, and anyone who should know of any data on any station at either of these places will do Mr. Falconi a favor by advising him of the fact.

The Southern Transcontinental Route is as busy as bees now-a-days, and is not unusual to handle as many as thirty and forty messages to and from the West Coast, and let us say that due credit should be given 6IG for making this route so dependable.

The Transcontinental Tests went through 5ZA as smoothly as could be desired with exception of the first evening, when a mistake in dates by several stations on this route caused confusion and much delay. The two following nights, however, brought some highly efficient operation, especially on the evening of the second test, when the message was lifted from 5ZP direct and handed to 6IG, and westward. On the third night the message went via 5YH, 5ZA, 6IG and Coast. It took just about as long for this message to grind through these stations as it takes to tell the story.

In the Special-Time-Test, at first 6ZK connected with 6JD, then to 5ZA, 9ZN and 1AW. The first message went through these stations. The answer from 6ZK was copied at 5ZA direct and thence to 9ZN and 1AW. Later connection was lost with 6ZK due to rain storm, and 6JD, found it very difficult to keep his tubes going, the QRN killing them. However, this station was made the west terminal in place of 6ZK and many more messages went to and fro.

The situation in the Austin Texas Territory according to Asst. Dist. Supt. Rives' report, is practically unchanged.

The Houston Texas Territory, as Mr. Daniels, Asst. Dist. Supt., reports is encouraging, with stations at Galveston and Port Arthur soon to be open which will give us an outlet to the Gulf.

Thus far in January many good records have been made, and traffic has been moving nightly, together with a considerable amount of day-light work.

Nearly all Houston stations can work 5BI successfully as early as six p. m. and quite a bit of traffic has been going north by that route.

Of special importance from an information standpoint, are the two new special stations in Houston: 5ZE, B. J. Still, testing station of the Hurlburt-Still Electric Co., radiophone concerts every Sunday on 375 meters from Edison phonograph with new Magnavox Transmitter and DeForest Phone between 3 and 4 p. m. 5AO now bears the call of 5ZX.

The Houston Radio Club sent two representatives to the Midwest Convention and

their trip was related for the benefit of the club at the last meeting.

Much useful information was obtained first handed, and by the representation, stations and conditions existing in this locality will be better understood by other state citizen operators.

We are pleased to announce the full recovery of 5EO of Freeport, Texas, who has been ill for something like four months.

5KQ of San Antonio is now working and has been heard in Austin, but he does his best work with 5YK at New Braunfels.

A little note reaching headquarters this month states that 5HV of Commerce, Texas' handled 64 messages.

We desire to announce the appointment as District Superintendent of Lowrin G. Dill of the state of Oklahoma. His address is 234 Broadway, Oklahoma City, Okla., and we wish him much success in his new office.

Asst. Dist. Supt., C. M. Selby of the Muskogee Okla. Territory reports Mr. Bryce Ballinger of Miami, Oklahoma, is to have a station going soon, and that Mr. Sams and Tantum are installing a three-quarter K. W. in Muskogee.

Asst. Dist. Supt., M. C. Poor, of the McAlester Oklahoma Territory, is getting on the job and doing some splendid organization work, getting all the fellows lined up and going.

Total messages, 861. Busiest Station, 5ZA—286 msgs. Louis Falconi, Roswell, N. M.

NEW ENGLAND DIVISION

G. R. Entwistle, Mgr.

Several complaints have been made lately concerning reports from relay men and district superintendents by the Asst. Div. Mgrs. This subject has been discussed repeatedly but let us try hereafter to get out reports in, in this manner:

Relay men to Dist. Supts. before 15th of month.

District Supts. to A.D.M.s before 20th of month.

A.D.M.s to Division Manager before 25th of month.

A.D.M. Robinson (1CK) reports that Northern New England seems to be returning to the radio map again and 1UQ, 1FV, 1UL, 1RAY, 1DAC, 1YB, 1OE and 1CM are almost nightly visitors around Boston. 1RAY seems to present a very good route through to Canada without going through any more stations and he is easy to work from Boston.

Thanks are due to 1AB, 1CZ, 1AI and 1EP for helping out on getting the Transcons into Boston.

1AE, 1AK and 1KC are recent additions to the CW end of the game around Boston.

A.D.M. Mix (1TS) reports matters having progressed in fine shape during the past month, although there was a slight decrease in actual traffic handling on account of the Transcons and QSS tests.

D. S. Nichols reports west bound traffic being handled fine but as having a little difficulty in getting traffic north. Mr. Nichols has his aerial and counterpoise up again after it was completely wrecked in a storm.

D. S. Randall of Hartford reports great activity in his section, in fact too much activity at times. 1RU has been doing fine work on his CW set this month, stretching out to Chicago, Wichita and Savannah.

During this month several stations have done notable work. 1AW and 1BBL were in on the ARRL Transcons and did fine work. 1AW and 1BRL also have been serving as transmitters in the January Bureau of Standards QSS tests while 1NAQ and 1TS were serving as additional recorders.

1NAQ and 1JQ did fine work in reporting the large fires in Springfield and Tariffville to the press and also notifying the Hartford Fire Department to be ready in case outside aid was needed. D. S. Randall reports that two of the DX stns. in the vicinity of Hartford persist in working before 10 p. m. which is in violation of the rules laid out by the Radio Club of Hartford which provides that DX men suspend operation until 10 p. m. when the coils etc, will then stop and allow the DX men to work unmolested. Why isn't this a good ruling for the whole Division? Also there is a large amount of testing being done by some of the DX men around Hartford after 7 p. m. It is hoped that this will not continue.

Boston City Manager's Report

P. J. Furlong.

The time schedule which was recently put into operation has received splendid support locally. However, there are a few stations operating with spark coils straight in the antenna that cause QRM after 10 p. m. Many of our local DX men, who expect clear air after 10 p. m. show an entire disregard for time periods "B" and "C" on the schedule. Full power is used for local work which means the lower powered station has to stand by.

Some of our local "CW" stations are probably not aware of the time schedule, judging by their actions. A copy was mailed to every amateur in the 1st District and also published in a recent issue of QST. If you have not received a copy, one will be mailed you upon request.

On several nights during the fading tests, the work of some of the recorders was made valueless owing to the thoughtless operation of some local would-be "DX" stations. The apparent quiet could

not be understood, so things were brightened up by many long drawn out "CQs."

Total messages, 125. Busiest station 1BM 61 msgs. H. E. Nichols, 513 Pequannock street, Bridgeport, Conn.

PACIFIC COAST DIVISION
E. G. Arnold, Asst. Mgr.

Many changes for the better have taken place west of the Rockies since the last report appeared in QST. Practically all the good operators, (25 words per minute boys) are with the ARRL. We are glad to report at this time that the Bay Counties Radio Association have affiliated with the League.

Santa Barbara has been dead as far as radio goes for some time, appearing to be in a sort of pocket, but now we have a real operator, Mr. Roebuck, 6AAK, and a good station there. He deserves much credit for the manner in which he has been handling traffic.

6JD, 6ZN, 6EN, 6ER, 6SK are also deserving of praise due to the manner in which they have been handling relay work in their locality.

6JI of San Diego is now working north and east very well regardless of NPL mush.

6IG of Douglas, Arizona, is also working to the coast fine, having worked old 6Bj, now 6ZR, of Burlingame, three nights in succession.

We are sorry to report at this time that Mr. H. Shaw, 6BN, of San Francisco has discontinued his radio activities. We still have the old reliable 6OC who is a good operator and does everything he can for our league. Regarding traffic around San Francisco, before the war no great steps were made but now the conditions have greatly changed. Hall Berringer, 6ZR, formerly 6BJ, has taken matters in hand. He has two complete transmitters, 200 and 375 and is handling the traffic through the QRM in a remarkable manner.

Our manager, Mr. A. E. Bessey, has been doing some wonderful work. Upon his arrival home from the St. Louis Convention he received a card from Ohio stating that 6ZK was QSA in Ohio.

We can not give Vance Wise, 6EJ, enough praise in this column. He is one of the steadiest men on the job, on the Pacific Coast. 6AK of Walnut Grove is also doing excellent work. We have a new 500 cycle quenched transmitter in Stockton, 6FI, which is doing fine work. A long needed station in Ukiah has now been found in the hands of a good operator, 6OH. He has been doing some fine work.

Due to the efforts of our manager, Mr. Bessey, we have developed a QRX period, Monday and Wednesday nights between 9

and 10 p. m., making it possible to hear many stations to the East. We wish to extend our thanks to the many who are co-operating with us on these nights.

Best route to the east: 6ZO, 6ZA or 6ZM. Best route east via south: 6IG, or 5ZA. 5ZA reported heard by 6ZK, 6ZR and 6AT, actual communication was reported established with 7CU, Mumford Bros. of Vancouver, Wash.

ROANOKE DIVISION
W. T. Gravely, Mgr.

This Division has seen greater activity during the past few weeks than ever before in the history of the ARRL. Many new stations are being erected, and the old ones are becoming more efficient each week. The greatest draw-back, however, is the tremendous amount of QRM, which is ever-present, and which is the cause of the failure of many long distance stations to carry traffic through in better shape. I am sorry to note that unnecessary QRM is rapidly growing, and to curb this evil as much as possible, let us of the Roanoke Division refrain from making unnecessarily long calls, as a beginning.

It is most pleasing to report that I have had letters from individuals in other Divisions commenting on the fine co-operation of the stations in this Division, and especially does this apply to those on the Seaboard. It makes us proud to have such things said of us, and to all of you who have shown such a fine spirit of co-operation we extend our thanks.

Mr. Jno. F. Wohlford, 3CA, District Supt. Southwest Virginia, reports a great deal of activity in his section. (Note; 3RF is now William S. Creighton, 434 Washington Ave., S. W., Roanoke, Va.

Mr. Wohlford deserves a great deal of credit for the splendid pioneer work he is carrying on in his District.

Mr. C. D. Blair, 3ZL, District Supt. Central Virginia, reports conditions very satisfactory in Richmond. He states that on January 17 the amateurs of the city met at the High School and formed the Tri-County Radio Club, with an initial membership of forty. Mr. G. C. Robinson, 3NG, was elected Secretary, and Mr. C. D. Blair, 3ZL was elected Advisory Chairman.

3TJ is temporarily out of commission, as well as 3ZL and 3UU.

Mr. Blair states that he is determined to link Richmond in with all of the lines, and to become an important clearing point in the Division.

Mr. F. L. Bunker, 4CE, District Supt. North Carolina, has a most enthusiastic report. The Manager has just been honored with a most delightful visit from him, at which time field conditions were dis-

cussed. He has requested that Mr. Gluck, 4CQ, of Charlotte, be appointed Assistant District Supt. for the State of North Carolina, and in future Mr. Gluck will occupy that position. He will have his station, 4CQ, in full blast by February 15.

Mr. Bunker states that there will be three 1K.W. stations in operation at Charlotte, namely; 4XD (he is now doing work nightly, with a C. W. outfit,) 4CE, 4CQ and 4FO.

3EN. Mr. T. C. White, Jr., City Manager, Norfolk District, reports all DX stations in his District in operation during the past month, except when his own plant was temporarily disabled, due to a fallen mast.

3GO, Mr. Hopkins; 3VV, Mr. Kubiac; 3FG, Mr. Herndon; 3AB, Mr. Gilpin and 3EN, Mr. White have all handled their share of messages, and in addition, station 3ACE, Mr. Koon of Portsmouth, and 3ACT of Norfolk, are breaking into the relay game. Stations 3JX, 3AAG and 3QQ of Newport News are lending hearty co-operation.

It is with pleasure that we welcome Sgt. R. H. Blair back from his vacation. He is in charge of Station XF-1, Langley Aviation Field, Langley Field, Va., and has been doing long distance operation of material assistance to the ARRL.

No change in the QRM from NAM, so Mr. White reports. He says that, in addition to QRM from spark sets, he now uses the Arc, which renders impossible for them to even hear long distance station.

Mr. Heck, District Superintendent, West Virginia, Mannington, writes that affairs in his District are progressing, that many new stations are beginning to operate, and only need to be shaped up to enter the relay game.

Mr. Heck's station has been out of commission.

8SP at Fairmont is handling a great deal of traffic in his section, the northern clearing point for the west in West Virginia.

Efforts are being made to create definite working lines on down through West Virginia, with an ultimate daylight line, into Virginia, and thence on down to the borders of South Carolina.

Total messages 500.

ST. LAWRENCE DIVISION A. J. Lorimer, Mgr.

Our local reports quite good this month but we are still short "one good relayer to U.S."

Dist. Supt. Buzzell reports improving conditions thruout his district.

Major Stethen has installed a good set at the Cavalry Barracks, St. Johns, P. Q.,

call 2DD.

He is working the Montreal stations regularly and QSRs traffic collected at 2AX, Stanbridge East. The latter station, equipped with $\frac{1}{2}$ " spark coil, has been covering the 55 miles to Montreal direct in daylight but not strong enuf to get thru during interference.

Mr. Buzzell is doubling the power at 2AS shortly. 1GY may work him next time they are QSO.

New stations are reported at Niagog and Sherbrooke.

Daylight freaks seem to be quite common 2AB has been reported several times at Montreal.

No report from the Levis District. There does not seem to be much doing north of Nicolet this season.

Total messages 28.

CENTRAL DIVISION

R. H. G. Mathews, Mgr.

In contrast to the heavy traffic handled during the Christmas holidays, the message relay work during January seems small. However, in comparison with that of the previous ordinary months this traffic is entirely normal. All the District have been handling their traffic in fine shape and we are especially glad to note increased activity in Kentucky. The total messages handled in the District of Kentucky during the past month is 218 and Mr. Kolb, the District Superintendent, and his assistants deserve great credit for the good work they have been doing both in organization and traffic work. For the information of Kentucky stations who wish to get in on the relay organization, the following is a list of the personnel in that state. Operators desiring appointments as City Managers or relay stations should get in touch with the nearest one of these men. District Superintendent, Mr. J. A. Kolb, Jr., 90X, 1101 E. Broadway, Louisville. Asst. Superintendent, Mr. B. L. Brown, 26 Alexandria Pike, Newport, Ky., 9UH. City Manager of Covington, Mr. C. W. Kleaman, 9VZ, 2011 Garrard Street. City Manager of Louisville, Mr. C. L. Pfleum, 90X, 1944 Deerwood Ave., Louisville. City Manager of Newport, Ky., Mr. A. C. Hengelbrosk, 9IO, 922 Washington Ave.

In the District of Eastern Ohio, we regret to say that we are losing our old stand-by Rev. A. J. Manning, who feels that because of poor health he cannot give his position the time and attention it needs. At his recommendation, Mr. R. D. McCommon, 8FD, East Palestine, Ohio, has been appointed District Superintendent of Eastern Ohio, the rest of the personnel of that District remaining the same. Mr. McCommon is taking over the District this month and it is hoped that he will get the same co-operation from the members of

the Ohio traffic personnel as did Mr. Manning.

In the Miami Valley District of Ohio the District Superintendents report the following new appointments: City Manager of Columbus, Ohio, Mr. D. S. McDowell, 8EC. City Manager of Dayton, Ohio, Nelson Emmons, Jr., 8TN.

In addition to these appointments the following routes have been formed in the Miami Valley District: Cincinnati and Southern Route: 8ZL, 8FT or 8TN, 8AKV or 8AFS to Kentucky and other southern points. Route in daily operation. Columbus Route: 8ZL to 8EC or 8HG in daily operation. On this route there is an excellent chance to connect up with the Eastern Ohio District if the stations east of Columbus will but come forward and make themselves heard. Indiana Route: 8ZL, 9RL to Indiana points north and south. Not many nor long routes can be formed in the Miami Valley District because of the size and shape of the District. Those routes that do exist are in daily operation thus giving prompt service to all points in the district as well as connecting with other districts at various points. The District Superintendent would like to hear from any one wishing an appointment.

We regret to say that the District Superintendent of Northern Indiana, Mr. H. H. Moore, has been very ill during the past month. In spite of this fact Mr. Moore has managed to handle his District very satisfactorily, especially in view of the peculiar conditions existing in Northern Indiana. Five of the best stations in this District are out of commission temporarily which is a tremendous handicap. Mr. Moore's work is being limited by the fact that he does not have sufficient stations in his District to carry out any official traffic organization. All station owners in this part of Indiana are therefore urged to communicate with him at 922 Madison St., Elkhart, Ind., at once. Indiana should be the link between Ohio and Chicago and it cannot fulfill this function without the co-operation of every operator.

Mr. H. L. Ley, 8ZV, City Manager of Canton, Ohio, is interested in hearing from CW stations west of Canton with a view to arrange a schedule on CW for west bound traffic. The Division Manager believes that a route of CW stations throughout the Central Division would be of great advantage, especially for daylight or summer work, and the attention of the District Superintendents is called to this means of communication.

The District Superintendent of Michigan has also been ill but has managed to handle his District in his usual efficient style in spite of his handicap. Mr. Darr

is employing a unique and interesting method of securing publicity. He is editing a column in the Sunday edition of the Detroit News giving a short article each week, together with answers to questions submitted by readers. This in combination with a radiophone set at the Detroit News is doing much to secure better co-operation among Detroit amateurs. The Detroit Radio Club now has the Chicago Plan in operation and Mr. Darr reports that it is working out in fine shape.

In the District of Wisconsin Mr. Homer, U. Bishop, 9DV, Neenah, Wisc., has been appointed Assistant District Superintendent and given charge of the Fox River branch of this District. Mr. Bishop served in the Signal Corps overseas during the war and saw active service in Germany with the Army of Occupation. He is personally acquainted with the radio men in the towns under his jurisdiction and he certainly will be a big asset to our traffic personnel.

Mr. Burhop is continuing his membership drive in Wisconsin and from the results which are forwarded through this office we believe that he must build stations in order to get their operators in the A.R.R.L. We would suggest that some of the other Superintendents get in touch with Burhop to find out how he does it as he is certainly remarkably successful.

Appointments of official relay stations in the District of Wisconsin are as follows: 9AYE, Mr. W. E. Hanna, Beaver Dam, Wisc. 9AIP, Stanley Fisher, 1572 Packard Ave., Racine, Wisc. 9ACM, Kraus & Steffen, 1611 No. 8th St., Sheboygan, Wisc.

9ZL has been out of commission for several days following the storm of January 19th which carried away both masts. This must have been a real storm since it also took down the steel tower at NTY and since Burhop is connected with both 9ZL and NTY we believe he has had the pleasure of helping put up both aerials.

No January reports were received from the District Superintendents of Illinois and Southern Indiana and no information can therefore be given on the activity in these District during this month.

In the Toledo District of Ohio, the following new City Managers have been appointed: C. C. Endley, 8ZN, City Manager of Mansfield, Ohio. E. W. Tarbox, 8VJ, City Manager of Findlay, Ohio. R. K. Stolzenbach, City Manager of Lima, Ohio.

The District Superintendent, Mr. Duerk of 8ZY, reports as follows: The Assistant Superintendent, Mr. Preston, 8IK, reports the following changes in the branch routes connecting with 8IK. Cancel 8JF, 8OI and 8MM from branch routes #1 and 2. These stations out of commission. Route #1

should now read, 8IK to 8HI to Cleveland. Cancel route #2 as there are no stations in Lorain at present who can work out of town stations. 8VS New London, is anxious to get in the game. He operates a CW set and can handle Huron County OK. Route #3 should now be 8IK to 8VS to 8IZ to Sandusky. 8IZ is now working Sandusky OK but don't know who. Am unable to locate anyone in Port Clinton. Route #4 is now OK as far as 8AJK. Ohio Wesleyan University station formerly "OWU" is now 8YK.

Traffic going to Toledo at present, must travel over Uncle Sam's route, going to Toledo by mail from 8ZY. This is unavoidable at present, but am trying through my city manager 8ZB, with the hope of locating some station there to temporarily handle the traffic. 8ZB is still out of commission, and 8IR, who has been doing such fine work, has been forced to suspend operating his spark set, because of difficulty with the power company.

We now have a positive route, which can handle traffic from Chicago to the eastern border of our Division. 9FS, 9FG, at Goshen are able to work the Chicago stations, they in turn QSR to 8ZY, with 9HR and 9DF as intermediates 8ZY has no difficulty working with 8IK or 8ZR at any time, tho we have 8VJ and 8GB as intermediates, from 8IK we connect with 8ZG's district through 8GE who is always QRK at 8IK, and also at 8ZG. Quite a bit of traffic has been going over this route, and so no delays are now experienced in getting traffic thru. Rev. Manning reports that when traffic gets as far as 8ZG, it is sure QSR east, so we think we can relay Chicago traffic to New York over daylight relays.

Total Messages Dec. 3274. Busiest station 9CA, W. Taylor, Minonk, Ill.

Total Messages Jan. 3085. Busiest station 9ZN, R. H. G. Mathews, 1316 Carmen Ave., Chicago, Ill.

MID-WEST DIVISION
L. A. Benson, Mgr.

The Division Manager desires to thank all of the division personnel for the splendid co-operation during the Trans-Continental tests and the Bureau of Standards fading tests.

9HT reports that during the past month many new stations have opened in his district. Mr. Anderson of 9EW deserves great credit for his traffic handling and will work alternate to 9HT. Two new stations are reported handling traffic, 9AJS and 9ALO, the former of Oakland and the latter of Blair, Nebraska. Mr. O'Rourke reports a great deal of malicious QRM in his section and also the use of unauthorized calls. Fading is still prevalent, especially from Kansas stations.

Stations further south, such as 5ZU and 5ZP, show very little fading in Omaha. Mr. P. A. Stover of 9JA reports the following changes: 9AWX is helping 9MS in the Davenport section, 9AMU has been added at Marshalltown, 9YI has been added in the Des Moines section, 9AEQ is doing splendid work in handling traffic. Mr. Stover also reports that if 2RK is the sleepless Easterer he thinks that 9JN has the title for the West. Mr. T. E. Brune, 419 N. Clinton St., Iowa City, Iowa, has been appointed second-assistant to the District Superintendent. 9IF of Giltner reports four new DX stations in Hastings and one in Kearney, Nebraska. Turner of 9DU deserves credit for his splendid work in getting new station operators interested in our A.R.R.L. Mr. Turner reports that due to working conditions he cannot handle traffic until 2:00 A.M., after which his station is open for any western traffic. Mr. Otto S. McDaniel of Sedalia, Mo., has been appointed second assistant to Mr. Turner. Mr. J. B. Abercrombie of 1825 Frederick Ave., St. Joseph, Mo., has been appointed city manager. Mr. Abercrombie is executive officer in the Northwest Missouri Radio Association. 9LR of Anthony, Kansas is at present one of the main linking stations between the east and west coast and this station deserves great credit for the number of messages handled during the past month. H. L. Owens of 9EL reports that Mr. O. A. Kimball, his assistant, is suffering from broken ribs and Mr. Ira Graham of Eldorado, Kansas, has been appointed as second assistant District Superintendent, and Mr. Paul Willis of 9OE Wichita, Kansas, has been appointed city manager of Wichita. These men have made exceptionally good records. 9AEG second assistant, reports a new station at Eldorado Kansas, 9AEQ is handling a great deal of traffic. He also reports the organization of the Y.M.C.A. Eldorado Club which has a membership 100% A.R.R.L. The Division Manager requests that all District Superintendents kindly mail in monthly reports before the 25th of each month. Total messages 2127.

**Do You Belong
to the A.R.R.L.?**

Your sole requirement is a bona-fide interest in Amateur Radio.

Write to the Secretary at Hartford, Conn.



6ZK, SUNNYVALE, CALIF.

THE photograph on our cover this month is of a station of more than ordinary interest—that of the genial Mr. A. E. Bessey, our well-liked and extremely successful Pacific Division Manager. 6ZK is the result of over ten years experimenting, and now is as business-like a relay station as one could wish for. It embodies several principles which we think very desirable in a good relay station—whipping the transmitter into shape and then putting it out of the way, with the controls disposed handily, and nothing on the operating table but the receiving set, the key, and a control button. These things make for efficiency in handling traffic, and we know our readers agree us in the feeling that 6ZK is a peach.

The entire equipment of this station was designed and built by The Radio Shop, San Jose, Cal. The transmitter is panel type, with the component parts mounted in the rear and all controls on front, mounted on the wall over the operating table so that the actual transmitting apparatus is located in the next room. The controls provide for instant change-over between the two wave lengths commonly used, 200 and 375 meters, and also for the use of 300 and 600 meters as required by special licenses. Front control of coupling is provided, also a four step variation of power. The transformer is 1 k.w., used with mica condensers and a 12-point rotary gap running 3450 r.p.m. Thermocouple ammeters are used in the transformer primary circuit and in the antenna circuit. The antenna current on 200 meters is 7.5 amperes, and 8.5 amperes on 375 meters.

A steel mast 95 feet high supports three antennae. One consists of 11 wires 120 feet long on a 20-ft. spreader, running almost vertically, which is used for the

375 meter wave. A smaller T type gives the necessary period for the 200 meter wave without a series condenser. A long two-wire aerial, at right angles to and isolated from the transmitting aerials, is used for receiving, and makes possible a very satisfactory break-in system. No aerial switch is necessary when separate aerials are used, and the two being at right angles, the energy picked up on the receiving aerial when transmitting is not bothersome.

The receiver is in four units of similar construction and is as pretty a job as we have ever seen. The first unit is an antenna series variable condenser and the second is a short wave regenerative tuner of the usual variometer type. On the extreme right is a detector and two-stage audion amplifier, while the long cabinet in the center contains an Armstrong superheterodyne circuit with radio-frequency amplification. The first tube is the initial detector, the second is the heterodyne, and the next six are the r.f. amplifiers, resistance-coupled. A plug and jack system is arranged whereby the bank of r.f. amplifiers can be cut out when local and semi-long-distance signals are to be received.

Mr. Bessey confesses to the modest ambition of some day working 1AW. If only he'd put in a C.W. transmitter—!

Since the above was written we learn that on Jan. 15th. at 5:05 a. m., E. S. T., 6ZK was heard while calling 9ZN by both 8ZY, Defiance, Ohio and 2TT, New York City; and that on Feb. 17th. he was again heard by Mr. H. D. Selvage in Irvington, N. J.

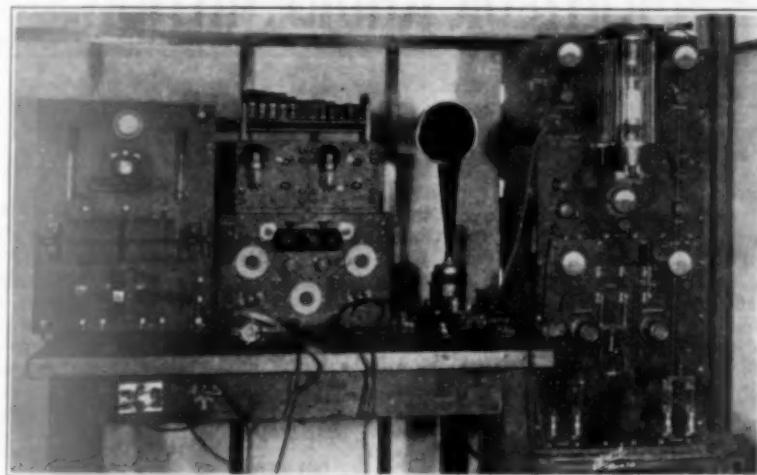
So his dream of getting thru to the Atlantic is not an idle one!

9BY, ROCK ISLAND, ILLS.

9BY, the amateur station of the Karlowa Radio Corp. at Rock Island, Ill., is doing good work on its evening schedule of 7 to 10 p.m. and promises to be of help in overcoming the difficulties of transmission which have long existed between Chicago and the Tri-Cities.

as amateurs within range have supplied them with a slogan: "When 9BY is called, it answers". A lot of the secret is in the tube equipment, hard bulbs being used so that very little fussing is necessary and the operator can give his attention to tuning.

9BY gives a phone concert every Thurs-

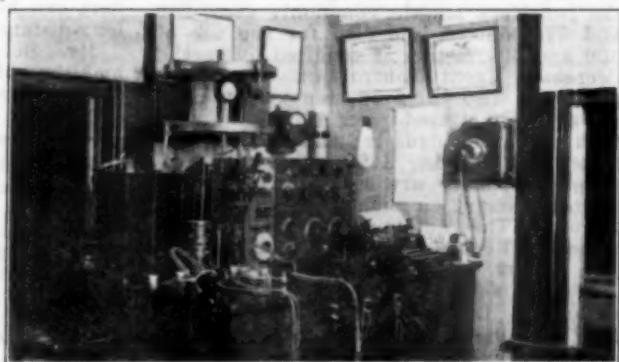


9BY is equipped with a $\frac{1}{2}$ k.w. DeForest Oscillion transmitter and a 1 k.w. spark set, making available for instant use by means of the proper control, C.W., I.C.W., phone, synchronous rotary spark, and 120 cycle quenched spark. Honeycomb coils exclusively are used in receiving, for short as well as long waves, as they have found tickler regeneration more reliable and stable for their work, and they work there,

day evening between 8 and 9 o'clock which is regularly heard over 300 miles radius, and the voice and I.C.W. signals regularly covers up to 900 miles. The antenna current on 200 meters, C.W., is 3 amperes; on voice, $2\frac{1}{2}$ amps. They would be pleased to hear from amateurs who pick up their signals and want their criticisms as well as their compliments.

5ZX, HOUSTON, TEX.

We've had photographs of a number of Houston stations lately but there is always room for one more, especially an outfit as clean-cut and business like as 5ZX, ex 5AO, owned by Mr. A. P. Daniel, president of the Houston Radio Club and A.R.R.L. Assistant District Superintendent. Mr. Daniel's earlier station was shown some months ago in QST, and the comparison will show his progress in this game of ours wherein there is no such thing as standing still.



The transmitter has a 1 k.w. Thor and a Thor O.T., home-made condenser, and home-made semi-quenched rotary gap; the receiver, a Grebe CR2, home-made detector-and-two-step, and Baldwin phones. The antenna is a 4-wire inverted L supported by a 62 ft. mast made of tin gutter pipe after the style made famous in 1916 by S. Kruse.

CANADIAN 3GE, TORONTO

This photograph is of the one of the Dominion stations, operated by Mr. G. W. McClain, Toronto.

The aerial is an inverted L 40 ft. high and 75 ft. long, with a counterpoise of

5ZX's transmitting records (mostly under the old call 5AO) include New York City (three times) 1435 miles; Douglas, Ariz.; Denver, 875 miles; Ellendale, N. D., 1125 miles; St. Paul, Chicago, Detroit, Cleveland, Washington, Philadelphia, etc. The receiving record is 6CO at San Jose, Cal., 1600 miles.

50-meter aerials look like. We never saw one.)

Mr. McClain's transmitting panel, in addition to the meters, holds a half-k.w. transformer, with primary taps to a switch

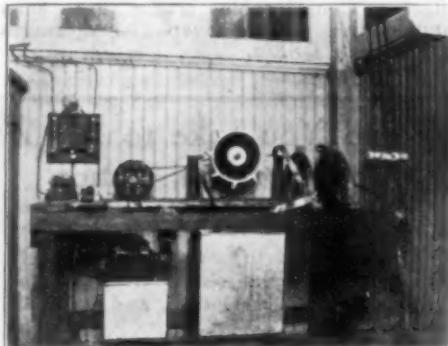


similar length under the aerial and 2 ft. above ground. A single 300-ft. wire gives better receiving results, however. (We wonder if the miniature aerial on the upper-left ceiling is what those Canadian

on the panel to vary power, while the balance of the apparatus is on the table and comprises a Signal glass-plate condenser, variable by a fan switch, a saw- (Concluded on next page.)

8VJ, FINDLAY, OHIO

Mr. Edwin W. Tarbox sends us this photo of his station, 8VJ. Distant control is used, the receiving room being about twenty feet from the transmitter, and no view of the operating room is available. The transmitter has an oil-immersed Thor, an oil-immersed condenser, a belt-driven Hyrad gap, and pancake O.T. 8VJ puts out about 7 amperes with 5-inch coupling, but we don't know on what kind of a meter. The relays for distant control are seen on the extreme left of the table, with the kick-back preventor on the wall above.



tooth gap, and a hinged pancake O.T. with 4-inch ribbon on the primary and 2-inch on the secondary. (United States amateurs please note.) Having just recently got connected up, 3GE has as yet worked no great distance, but has been heard OK in Bridgeburg. He would like to try Buffalo amateurs any day between 12:30 and 1:15 p.m.

The receiving unit employs honeycomb coils for tuning, an Electron Relay detector, and Marconi Class II tubes for amplifying. His cabinet is certainly a

neat and business-like job. A large number of American amateurs are copied, in the 1st, 2d, 3d, 8th and 9th districts.

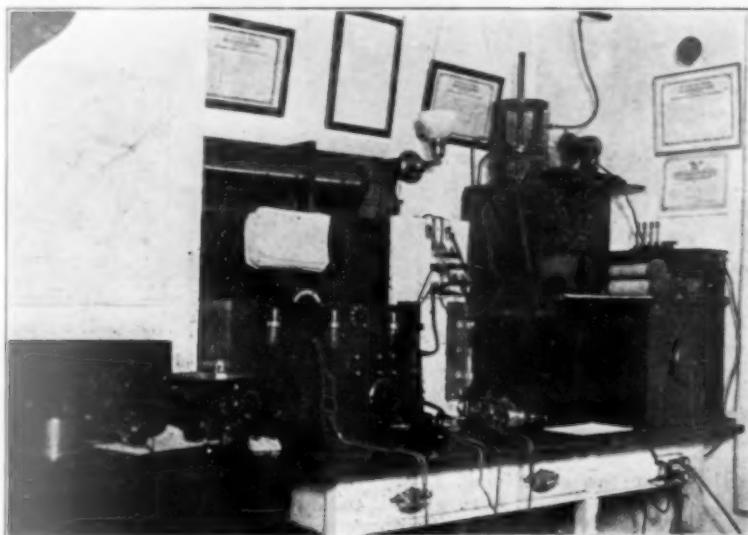
Mr. McClain promises us more later about the mysterious cabinet on the right, which seems to be a radiophone. By the way, note his interesting style of construction, as employed in the phone, the tuner, and the gap unit, of building a cabinet having a panel for part of the way and a kind of shelf at the top for placing parts that have to be got to or watched.

3HJ, HAVERFORD, PA.

3HJ is owned by A. D. and A. H. McNaughton, of Haverford, eleven miles west of Philadelphia, and has quite a reputation for the strength of its signals.

at 3HJ during the Transcons for use in case of a break-down.

3HJ has carried on actual work over a distance of 1400 miles, and has also



The antenna is a fan of four wires 80 ft. high, with a 60-foot span at the top, which is to say that the spacing between wires is 20 ft. at the top, while the ground is to buried wires and the water system. The transmitter is the product of F. B. Chambers & Co. and consists of a 1 K.W. open-core transformer, glass-plate oil immersed condenser, a 6-tooth rotary running 8000 r.p.m., and a squirrel-cage O.T. of which 2½ turns are used in the primary and 6½ turns in the secondary. The antenna current is 3.3 amps. The receiver is home-made and consists of a variometer regenerator, detector and two-step. The RA-6 Paragon shown at the extreme left belongs to Division Manager Chas. H. Stewart, 3ZS, and was installed

worked 9EL, Council Grove, Kan., 1150 miles. Considerable traffic has been handled this season, over 300 messages having been QSR'd.

Would You Like to See a Photo of Your Station in QST?

We'd be glad to have it there, O. M. Send us in some good, clean photographs and a description, and we'll do the rest.

WITH THE AFFILIATED CLUBS



Second District Show & Convention

Are you all set? Are you accumulating the filthy lucre to take you to little ol' New York and back? You must, because on March 16, 17, 18 and 19 there will be held at the Pennsylvania Hotel the First Annual Radio Convention and Exhibit of the Second District, and it's going to be a real affair. The large Pennsylvania Roof has been secured for the exhibit, and all the manufacturers of prominence will have booths in which their apparatus will be displayed and explained and orders taken. The best apparatus in the country will be there for you to see, connected up in actual operation on aerials, and if there is anything you need you could never have a better chance to make an intelligent selection. Adjoining the Roof is the beautiful Butterfly Room, accomodating an audience of about 500, where on each of the first three nights there will be technical meetings, starting with an hour's lecture on vital amateur technical problems by prominent men, and followed by a series of 20-minute talks by the various exhibitors. On the last night, Saturday the 19th, there will be a big banquet in the Main Bal'room of the hotel at 6:30, with dancing afterwards. This banquet is for the ladies as well as for the men, and everybody directly or indirectly interested in radio is invited to attend.

The affair is being managed by the Executive Radio Council of the Second District. This council is composed of representatives from most of the Second District clubs, and while neither the council nor the show is officially an A.R.R.L. affair, we all know that good amateurs cannot meet without being pretty solidly A.R.R.L. men. This thing deserves your hearty support, fellows, and we want to see you there. An admission fee of 25 cents will admit any radio man to the exhibits and lecture room for the entire four days. Tickets for the banquet are \$3.00, and applications can be sent to F. C. W. Thiede, Cor. Secy., 486 Decatur St., Brooklyn, N. Y. The accomodations are limited to 500, and as this is going to be a big meeting, you had better get yours in at once.

There has never been such an opportunity for advancing Amateur Radio in this section of the country before. The

A.R.R.L. has secured Booth No. 21 and the Traffic Manager will keep A.R.R.L. Open House there during the show. You are invited to drop around and get acquainted and unburden yourselves on anything pertaining to Second District affairs.

Chicago Executive Council

The little "Grid Leak", the stenciled organ of the Chicago Executive Council, is now a full sized printed magazine known as "Radio Topics". The first issue is full of the pep of the Chicago boys, and it will improve and grow every month we know. It should be understood that the Chicago Executive Council is composed of the clubs in Chicago and vicinity that are affiliated with the A.R.R.L. and as its mouthpiece the policies of "Radio Topics" are those of the A.R.R.L. Its interest is in the continual improvement of amateur relay conditions in the territory under the jurisdiction of the Chicago council, but in its articles, etc. "Radio Topics" will be of national interest. QST greets a helper, and wishes it every success.

Radio Club of Tacoma

The Radio Club of Tacoma (Washington) extends a cordial invitation to all amateurs to attend their Second Annual Banquet in the Knights of Pythias Hall, Tacoma, Wash., Saturday, March 19th. Amateur Radio is booming in the Northwestern Division and this will be a real get-together meeting of all the radio men in that corner of the country. If we could only get out there from Hartford at the speed at which our Transcons move we'd be there too. Amateurs who can make the ripple better than we are requested to notify Al Stenso, 1921 So. Jay St., Tacoma, of their intention to attend, so that full provisions may be made for their comfort and convenience.

Detroit Radio Assn.

The "Detroit Radio News" for Jan. 31 contains the new traffic regulations adopted for Detroit and vicinity and approved by Radio Inspector Edwards. The basis of the plan is a division of working hours on the so-called Chicago Plan: All testing to be done before 6 p.m.; 6 to 10 p.m. local work; 10 to 11 p.m., testing for DX range under permit from the club's

Traffic Committee; after 11 p.m. relay traffic by certified DX stations.

The D.R.N. is a live little sheet, and in addition the club is running a radio column each Sunday in the "Detroit News", with fine publicity for Citizen Radio.

The club makes use of a new Q signal, QRR, meaning "Stop local conversation", for piping down QRM after 10 p.m.

The Twin Cities

By considerable odds the best local sheet we have yet seen is "Kick Backs", published monthly by the Executive Radio Council of the Twin Cities (Minneapolis and St. Paul) and the Dakota Division. Boyd Phelps, Division Manager, is its Editor, with H. R. Hail, Supt. of Southern Minnesota, as his assistant. QST offers its hearty congratulations. It's the kind of a paper we love to read—just chuck full of the real spirit of Amateur Radio, and if the birds out that way appreciate it half as much as we do the copy that percolates into GHQ, it will never stop. Its existence, the editors point out, depends on the co-operation the local men display in sending in ideas and contributions, but if the whole Dakota Division hasn't leaped into action to support the movement, we miss our guess. Congratulations, OM Phelps, and keep us on your mailing list. The price of a subscription until summer is 30 cents, which should be sent to R. K. Viles, secretary of the council, at 416 Court House, Minneapolis.

Radio Association of Western New York

The first meeting of the year was held Saturday, January 8th, when the installation of officers took place. Lunch was served after the meeting and a number of invited amateurs signed applications for membership.

With the beginning of the year, a notable benefit from our organization has resulted in considerable traffic being handled. Our Traffic Chief, Mr. A. H. Benzee, Jr., (8FE) has announced his pleasure at the co-operation of all amateurs, especially on A.R.R.L. fading tests.

The following traffic rules became effective on Nov. 1, 1920:

6:00 A.M. to 7:00 P.M.—Free air.
7:00 P.M. to 9:45 P.M. Local traffic only.
No testing or tuning permitted during this period.
9:45 P.M. to 10:15 P.M. No transmission of any kind.
10:15 P.M. to 6:00 A.M. Long distance traffic only.

Successful communication is now established with Canadian stations through 3BP of Toronto.

Mr. F. Clifford Estey of the Amrad Sales Force paid us a visit recently and recounted some of his experiences on

organization to reduce QRM.

The Radio Association of Western New York sends fraternal greetings to all radio organizations throughout the world.

Address all communications to Elmer H. Kumpf, Sec'y, 41 Amsterdam Ave., Buffalo, N. Y.

Nola Radio Club

A decided increase in amateur radio activity is manifested by the increasing attendance at the meetings of the Nola Radio Club. Not one meeting has passed but what new members were enrolled and we look forward to the time when all amateurs in this vicinity will be part of our organization. C-W transmission is coming into its own down here, one station already operating and two more in the course of erection, with promises of other stations following. At the last meeting of the Club an election for officers resulted in the re-election of the old officers, viz; G. A. DeCortin, Pres.; Chas. Johansen, Vice-Pres.; and C. J. Delaplaine, Secretary-Treasurer. Mr. DeCortin had just returned from a trip up north and had much interesting and valuable information on matters concerning amateur activity in the First and Eighth District. His lectures and enthusiasm are great factors in the success of the Club and all members show a splendid spirit of co-operation. He is ably assisted by the other officers and with all members pulling strong the Club cannot help but progress rapidly, continuing in its good work and promoting good-will and fraternity among the operators and experimenters here.

Radio Research Association

The Radio Research Association has been formed by the former members of the Scientific Research Club, a pre-war organization.

The club has installed a regenerative receiver with a two stage amplifier for temporary use. A short and long wave receiver, a spark transmitter and a C.W. set will be constructed in the near future by members of the organization.

The technical committee of the Radio Research Association is composed of experienced radio men.

We are forming a junior class for amateurs who are not of age yet to enter the senior organization. Instruction will be given in both code and theory. It is the purpose of the club to experiment in the field of radio and it will be beneficial to all interested in radio to communicate with us. We are affiliated with the A.R.R.L. and expect to take an active part in the relay work of that organization.

Meetings are held every Saturday at 8 P.M. at 258 Henry St., New York. The club rooms are located at 8 Pitt St., New York.

Communications should be addressed to the secretary at 8 Pitt St., New York, N. Y., or 233 South 3rd St., Brooklyn, N. Y.

Tri-County Radio Club

The amateurs of Richmond, Virginia, met at the John Marshall High School January 17th, 1921, and formed the Tri-County Radio Club. There were forty men present, and Mr. C. D. Blair, A.R.R.L. Supt. Central Virginia was elected Advisory Chairman, Mr. George C. Robinson elected Permanent Secretary, and Mr. Orris M. Selph Acting Chairman. Meetings the first Monday in every month, Room 207 John Marshall High School, Richmond, Va. at 8 P.M. A schedule regulating transmitting and receiving was adopted providing free air 6 A.M. to 5 P.M.; 5 P.M. to 6 P.M. standby for U.S. Bureau Market report; 6 P.M. to 8 P.M. local traffic; 8 P.M. to 9:30 P.M. standby for radiophone music and concerts from local and long distance radiophone sets; 9:30 P.M. to 6 A.M. solely for relay work. This was approved by all the members present and the schedule is in effect immediately. All correspondence is handled by the Secretary, Mr. G. C. Robinson, 657 North 8th, Richmond, Va.

Dallas Radio Club

5AJ has a newly acquired "OW"! District Superintendent Harold P. Heafer and Miss Jessie Wheeler of Dallas were married in that city on Jan 17th, and we are sure the tribe wishes them a happy and prosperous married life. Mr. Heafer, besides being D.S., is chairman of two committees and a member of the Board of Direction of the Dallas Radio Club, likewise a born key-pounder, so no doubt he will have his hands full for a while, with all kinds of "reports" to make.

He has done some excellent work in our club and its organization, being one of the charter members. He has always upheld its integrity and being fair minded, has helped to keep down those little dissensions and squabbles that don't seem so much at the time but if allowed to continue will in time cause a club to disintegrate until its members drop out thru lack of interest, hard feelings, etc., and it becomes a club in name only. Long may he radiate.

Jefferson City Radio Club

At a recent meeting The Jefferson City Radio Club reorganized and drew up a new constitution. The following officers were elected:

President Harold Engelbrecht

Vice President and Treasurer Sam

Blair

Secretary Bethel Brace

A committee was appointed to give talks

or a debate once every month and to make the meetings interesting to all who attend.

There are ten members in the Club, all of whom own and operate sets and are doing fine work. Special recognition is given those in the Club who operate licensed stations, thus encouraging the fellows to get licenses. The Club meets every Friday night and affords instruction as well as some wholesome fun. Correspondence from other clubs or individuals is urged. Please address all communications to the Secretary, 403 E. Ashley St., Jefferson City, Mo.

THE STORY OF THE TRANSCONS

(Concluded from page 12.)

ing at 1AW, there would be a few minutes of dead silence after 9ZN had relayed a message west; then, as we camped on his tune, there would come a solitary "r" which would be the unmistakable sign that he had copied the reply from 5ZA and which was confirmed as he instantly called 1AW and repeated it at a speed which made us scramble to get it on paper, and another message had made its round trip. That was the handling that every message got on the eastern end.

Countless new receiving records were set up during these tests, a number of 6's being copied in Ohio and vice-versa. In this issue, for the first time in A.R.R.L. history as far as we recollect, we have lists of "Calls Heard" reporting stations from EVERY DISTRICT! 9CA and 9GC report that on one night there was a time when they could hear 1AW and 6JD transmitting at the same time—both coasts.

We plan to make the Transcons an annual affair—an A.R.R.L. speed classic. The reduction in the record from 1:20 to 0:6:30 is so great that it will take a good line-up and good conditions to improve upon it. Just what can we hope to do? We don't know what the good stations will be a year hence (and it will be interesting to see how they change) but we can reasonably hope that we will have progressed by then to the point where just one intermediate relay, midway across the country, will suffice. Perhaps C.W. will be the solution. Then if we can get an exceedingly brief message, of just two or three words, permitting an answer just as brief, and can handle it at high speed without calling and without QTA's, we seem to have a possible figure of 1½ minutes for the round trip. That would be about the ultimate record, for if the intermediate station were eliminated it would no longer be a relay. However, 1½ minutes is so much less than 6½ minutes that we believe that even that splendid record is likely to fall when the next Transcons roll around.



The A.R.R.L. hasn't a complete list of its members who served in radio during the recent emergency. Accordingly we want to ask that every ex-service man send us his name, address, outfit, rank, and nature of duty. A postal will do.

Have you been hearing Catalina? Really? If you're near Los Angeles, OK, but if you live near New York, ND. We have had many letters on this subject and wish to explain that the voice is Catalina's all right but that the radio emission heard in the east is from an eastern station and not direct from the west coast. The AT&T and Western Electric are carrying out some experiments whereby the Catalina Island radiophone, at Avalon, 30 miles out from Los Angeles, communicates to mainland via radiophone, where the speech is fed into the transcontinental land line of the telephone company and conveyed overland to the east coast to a radiophone station, which in turn communicates by radio to the "floating laboratories" of the Western Electric Co., KQO and KQG. San Francisco, Salt Lake City, Harrisburg, Pa., and other inland points have been heard—but they are merely cutting in on the transcontinental circuit. So no wonder an amateur in Maine gets excited when he hears a voice say "This is Los Angeles"!

From the New York Globe we learn that Herbert Hoover was to send a message to the people of America via amateur radio, and that the amateur radiographers of the American Radio Relief League were going to watch for it. Quick, orderly, make ready the pneumatic chamber!

NSF, at the Naval Air Station, Anacostia, D. C., broadcasts a bulletin of technical radio information by radiophone on 350 meters at 9 p.m. E.S.T. and again at 10 p.m., every Friday night. We have heard the first two weeks' transmissions, describing the equipment at NSF and its operation, and if NSF is within your receiving range it is well worth your while to tune in to these broadcasts. You will find the information interesting and valuable.

Aviator Harry D. Copland of Boston, late of the R.A.F. and formerly a Boston amateur and ship-mate-operator of Division Manager Entwistle, has arrived in Florida

via airplane from Portland, Me. Arrangements were made by our Operating Department whereby a local amateur met him at scheduled stops with information on landing fields at the next stop, which information was obtained by radio from the next point south. The ship had no radio equipment, but Amateur Radio showed it could help. Blair, 3ZL, had him in tow during his stay in Richmond.

We neglected to state in the February issue that the list of calls reported by 9FD on page 69 was heard on a wire clothes-line five feet above the ground. Good work.

Mr. R. C. Denny, 6CS, sends us a description of his station which uses an indoor aerial 15 feet above the ground and consisting of six No. 18 wires, 3 ft. apart, 40 ft. long, stretched between porcelain cleats in his attic. Such an aerial having not near the requisite natural period for 200-meter transmission, large inductance coils containing 40 feet of the same wire are added at the free end of each antenna wire, to boost it. With 3 amperes in this aerial on 620 watts input, 6CS is reported QSA at 250 miles, and receives amateur signals up to 1000 miles. This idea will be helpful to those who use indoor aerials, and Mr. Denny is to be congratulated on his ingenuity and good work.

Mr. Denny is an engineer for the San Joaquin Light & Power Co. of Fresno, which has a hydraulic development under way in Kern River canyon, 125 miles south, in a very inaccessible location. It is only natural, therefore, that we should read that his company has installed radio to keep headquarters in touch with the project. Spark equipment is used, operating at 425 meters on limited commercial license, with call letters KDNU for Fresno and KDNT for Kern Canon.

4XB suggests that T.O.M. ought to be appointed Grand Bum Operator of the I Tappa Key fraternity.

NOTICE—On page 33 of January QST, regulations for handling traffic with Canadian stations were announced, and called for the intermediate signal — — — when a Canadian station called and worked a U.S. station. This signal is not so greatly different from the customary "de"

when ground out with the proper amount of Lake Erie swing, as unfortunately obtains in some places, so that confusion is resulting and the Canadians are not always recognized. The official intermediate signal for this work is therefore here announced as changed to ("fm"). Canadians will please note and be so governed.

U.S. stations should make more effort to connect with Canadians. Canadian 3BP, Toronto, is now doing excellent work and many of you will be surprised to learn it was a Canadian that you worked. If you have 3BP down it was he, as U.S. 3BP is idle at present.

Lots of spark apparatus being advertised for sale in our classified ads. Is CW wiping off the damped wave? (Echo from 9ZN: "NO!")

Looking for a Canadian connection? 3Z, E. W. Farmer, Farnham, Que. advises he is on watch every Saturday night from 10 to 12, wave 265 meters, and wants the traffic. QSA occasionally at 1AW.

Some newspaper articles on radio are really funny. 8KS sends us a Rochester clipping describing a station to be installed in a high school there. We are told that "with the exception of what, in compliance with the law, must be done by the fire marshal's men, the work of installation is being done by the boys themselves." Can one, in accordance with law, call upon the local fire eaters to help erect an antenna? Or, as 8KS suggests, maybe they're installing a fire box to use as an omnigraph.

"Geo. T. Hart, director of the club, said last evening that he believed the outfit was sufficiently strong to send messages to any part of the world, but that in compliance with the laws of this country foreign messages would not be sent. However, there will be exciting enough practice for the young operators in telegraphing to Chicago and other points in the United States.

"The station is nearly completed. This is a room . . . entirely enclosed in glass that the waves within may not be in the least disturbed by any outside."

Get out the old galena, gang, and dust 'er off, for when this outfit opens up our bulbs will be knocked for an eight day flip.

A radio note book is a valuable thing for the amateur. In it may be placed any notes pertaining to care and operation of radio apparatus; any clippings taken from journals; formulae and tables for calculations; hook-ups; sketches of apparatus—in short, any material which might be of

value to the station owner at present or at some future time.

Regarding tables: amateurs fail to realize how valuable it is to calculate inductance, capacity and wave length **accurately**. To do it requires in most cases the use of prepared tables and a knowledge of arithmetic. How much more efficient is an inductance with taps at the **proper calculated places** than one with taps at any place, regardless of necessity! Let's be more precise in our measurements.—Carlos S. Mundt.

Mr. Arthur W. S. Davis, 1LD, aged 71 years, pioneer member of the Lowell Radio Club, passed out in Lowell, Mass., on Jan. 25th. The Lowell club deeply mourns its loss—a loss that is amateur radio's in general. Mr. Davis was well known to the old timers, as he had been in the game from the start and had the distinction of having assisted Mr. Marconi in an exhibition of his then new invention in Lowell in 1903. Several of his patents are embodied in present day telephones, to which work he gave many of his active years. During his last illness when confined to his bed he had his set transferred to his room so that he practically passed away "with the receivers on". Isn't that devotion to the game?

"Many amateurs rendered good service with our troops on European battlefields, some whole wireless companies of the Signal Corps being composed almost exclusively of licensed amateurs. During the past year 5,988 amateur operators were licensed. From many points of view, the development of amateur interest in radio communication should be encouraged in the interest of the nation. The Bureau of Navigation hopes to be able to give to amateur apparatus and operators such attention as the staff and means available will permit."—From the Report of the Secretary of Commerce, 1920.

WOULDN'T IT BE WONDERFUL—

If 3DH would get down to 200 meters where a general amateur station belongs?

If the fellow that borrows our QST wouldn't give it to the baby to play with?

If 1XX sent radiograms instead of night letters?

If 3PU would listen more and CQ less, and would stop gumming up 600 meters?

If 8 . . . —Q would tell us what letter is?

If there were a cure for "side-swiper-itis"?

If 9ZN would hear 7DA at the same time 7DA hears 9ZN? (Wow!)

If there weren't so much wire in wireless?

If 200 meters were as long as a lot of amateurs seem to think?

If 8FI would stop worrying about his lost $\frac{1}{4}$ amp. radiation?

If you could only hear the guys that mail you cards saying that you are QSA?

If the Chief Opr. at 8XU (or the R.I.) would hitch one end of a rope to the secondary of 8XU's O.T. and the other end to a street car, and then run the car to the end of the line? (Yes, if the car line ran away from the primary.)

If regenerative sets sold for \$5.89?

If 7BA would leave out about half of his "OM's"?

If we could QRT NAM?

If we could find out what 8ZL's wave is?

If all radio inspectors were like Charles Kolster?

If Hewitt went to sleep on watch? (Hi!)

If 9LR would sell his coherer and buy a receiving set?

If 3IW got an answer from this guy CQ?

If 7HA and 9HK would learn the code?

If XB1 got an answer from XF1 in less than ten long calls?—or if he learned to make an X or a B?—yes, or if he made a short call?

Daily Radio Marketgrams.

Daily market reports are being transmitted by radio each week-day at 5:00 p.m., Eastern Time, at 400 meters from WWV, the Bureau of Standards station, Washington, D.C. These market reports are prepared by the Bureau of Markets, Department of Agriculture, for the information of farmers, cattlemen, and truck gardeners, and are sent QST with the intention that they will be copied by radio operators and transmitted to local papers for publication on the same evening. It is also desirable to post the information in post offices and other public buildings.

The sending of reports from WWV is an experiment which, if it proves satisfactory, will form the basis of a system of market report stations. In order that complete information may be secured as rapidly as possible, operators are asked to write the radio laboratory of the Bureau of Standards as to what success they have in receiving the reports, noting especially if there is any difficulty with fading, and if signals are of sufficient intensity so that it will be possible to receive them through summer atmospherics.

As the reports contain a number of price quotations, given in dollars and cents and fractions thereof, the following standard method of sending fractions has been adopted:

\$1.50 is sent as 1R50

\$1.50 $\frac{1}{2}$ is sent as 1R50 AND 1 DN 2

$\frac{1}{2}$ of 1 cent is sent as 7 DN 8 CENTS

65 $\frac{1}{2}$ cents is sent as 65 AND 7 DN 8

CENTS

The names of the cities most frequently mentioned in the reports are abbreviated as follows:

New York—NY, Baltimore—BALTO, Washington—WASH, Philadelphia—PHILA, Kansas City—KC, Chicago—CHGO.

If other abbreviations are required, their forms will be as readily understood as these.

During each period of transmission, 3-minute waits are introduced at 15-minute intervals.

There seems to be much confusion between stations NSF and WWV.

NSF is the station of the radio laboratory of the Naval Air Station, Anacostia, D.C. It is located at the confluence of the Anacostia and Potomac rivers. The laboratory is under the direction of Commander A. Hoyt Taylor. NSF is equipped with a high-power short-wave tube set, described in September 1920 QST. The set is used for I.C.W. and C.W. telephonic transmission.

WWV is the station of the radio laboratory of the Bureau of Standards, Department of Commerce. It is located at the Bureau of Standards, Connecticut Avenue and Pierce Mill Road, about six miles northwest of NSF. There are at present two transmitting sets in use, a 60-cycle 1-kilowatt set operating at 210 meters, and a 500-cycle 2-kilowatt non-synchronous set operating at 400 meters. The latter set is used until March 1, 1921, to send daily radio marketgrams each week-day, beginning at 5 p.m. Eastern Time.

They tell us 3DH has two sets and changes from one to the other at the ringing of a little electric bell whenever the rotary gap on the set in operation gets red hot. One set would hardly stand up the way 3DH keeps on the air.

9A1F reports copying 9LR and 5IS while listening on 5500 for XDA. Hi! Next time you fellows get QRM on 200 meters while after 9LR, plug in some L-450's and work right thru squeak boxes 'n' everythin'.

This actually happened at NAH:
O. I. C.: "Jones, do you know anything about Litzendraht?"
Super: "Dunno, sir, he ain't on my watch".

From one of our contemps: "The amateur fraternity can rest assured that whenever real (legislative) danger threatens, they will be advised quickly and effectively."

Yes—by the American Radio Relay League.

Radio Communications

by the Amateurs

* THE PUBLISHERS OF QST ASSUME NO RESPONSIBILITY FOR THE STATEMENTS MADE HEREIN BY CORRESPONDENTS *



RE THE H. C. R.

Atlantic Radio Co.,
88 Broad St., Boston.
January 6, 1921.

Editor, QST:—

I notice on page 59 of your January issue a letter signed by Mr. Heydon and Mr. C. W. Thiede in which they claim that drastic price reductions should be made in radio supplies and also stating as fact that certain concerns in the radio business are making 300 per cent. profit.

They invite expression of opinion from buyers and sellers. As an officer in a wholesale and retail sales house I take pleasure in expressing to them and to other readers the following facts:

First, that the statement of the 300 per cent. profit is false and cannot be proved. There is no reliable radio concern either making or demanding any such profit.

Secondly, that the above profit is an impossibility under the conditions which exist in the radio field today.

Third, drastic price reductions are impossible although in certain cases reductions could be made and should be made. Mr. Heydon and Mr. Thiede have argued from a point of view which seems, at best, childish and unsound. They failed totally to realize the following facts:

A—The acute conditions existing today from the various radio patents necessitating the paying of royalties to a certain few large corporations.

B—The fact that the turning over of stock in the wireless game is comparatively slow and hence—a high overhead charge results.

C—The fact that only experienced and highly trained workmen can construct and assemble really efficient apparatus and that these men of necessity draw large wages.

D—The fact that the whole science of wireless is progressing extremely rapidly and in order to have this state of affairs existent a tremendous amount of laboratory research work by highly paid technical experts is essential.

There is not one of us actively engaged in the radio business who does not desire to place before our customers good apparatus at the lowest possible figure but the above facts considered seem to me to explain the necessity of moderately high prices.

In closing, I wish to request from the gentlemen writing the original letter to make good their assertion that they can readily ascertain and prove the fact that radio concerns are making 300 per cent. Their failure to do so would seem to me to call for an apology through your columns, to all manufacturers and dealers in the radio line for the base slander and libel that they have asserted against those interested in the radio industry.

Very truly yours,
Frank Wigglesworth.

Cambridge, Mass.
January 10, 1921.

Editor, QST:—

On reading the communication, "The Price of Equipment," page 59 in the January issue of QST, our first thought was to refrain from giving this sort of Bolshevism serious consideration, but on second thought, from fear that at least a wrong impression might be created, we have decided to reply and state the facts from a legitimate manufacturers' point of view.

Let us first consider the 300 per cent. profit which these joint authors feel is being made by many radio concerns. Take a \$20.00 article which is sold to dealers at varying discounts according to the quantity. Suppose this amount is \$16.00 which our esteemed contemporaries say contains 300 per cent. profit which is \$12.00 leaving \$4.00. Now this \$4.00 must cover the following expenses:

Raw Material.

Direct Labor.

Overhead Expenses.

The Overhead consists of: Rent, Advertising, Office Salaries, Supervision, Office Expense, Factory Expense, Shipping Expense, Development Expense, Depreciation and many smaller Expenses whose totals cannot be neglected.

As a matter of fact that \$4.00 would not nearly cover the raw material on a \$20.00 article. It might cover the direct labor, but would hardly cast a shadow on the Overhead Expense. Reductio ad absurdum.

These gentlemen figured the profit on a slide rule and have not yet fixed the decimal point. We know because we have just completed our fiscal year, and also

completed those myriad of records and figures required from all corporations.

We would also call your attention to page 67 of the January QST under Strays, which states, "Wouldn't it be wonderful—if QST wouldn't print such rubbish as this?" and ask if this should not be put on page 59 under the article "Price of Equipment."

Very truly yours,
Acme Apparatus Co.
per C. F. Cairns.

(Now that both sides have had space in QST we feel that we must print nothing more on the subject. Our space is too limited and valuable—it's needed for other topics.—Ed.)

G.B. CALLS HEARD AT SEA

Division of Operations,
United States Shipping Board,
Emergency Fleet Corporation,
Washington
February 10, 1921.

Editor, QST:—

My attention has been invited to the fact that in the December and January numbers of your magazine, you printed articles showing work which has been carried on between Shipping Board ships and amateur stations, and in particular on page 32 of your December number, you printed an appeal to the commercial operators to supply you with information concerning the reception of signals from amateur stations.

We are in entire sympathy with the development of amateur radio telegraphy, as a great many of our commercial operators were formerly amateurs, but at the same time we regret very much to see an appeal made to our commercial operators to devote a part of their time on watch to copying amateur stations.

As you know, operators are required to keep watch on 600 meters, and time spent in listening on amateur wave lengths is time lost as far as the commercial operation goes. It is quite possible that some operator might fail to receive an SOS signal due to the fact that he was not listening on 600 meters.

We have also noted that some of our operators have been reported for using their transmitting apparatus on 300 meters to communicate with amateur stations, which not only causes unnecessary interference, but renders the commercial operator liable to cancellation of his license.

We trust you will realize the importance of this matter and will take steps to discontinue work between commercial operators and amateur operators. The number of amateur operators is so great, and they are to be found in such widely sep-

arated parts of the United States, that it would seem that the most enthusiastic amateur could test out his range with some other amateur without finding it necessary to call on ship operators for this purpose.

Yours very truly,
L. R. Rutter.
Manager, Operating Department.
By F. P. Guthrie.
Head of Radio Section.

CAGE AERIALS

4903 6th Ave.,
Brooklyn, N. Y.

Editor, QST:—

Referring to the article in the October issue of QST concerning cage aerials, I would like to offer a suggestion in connection with the separator rings. I have been building a cage along the lines described by Mr. Young and have found it to advantage to use copper tubing for the separator rings. I am using $\frac{1}{8}$ " O. D. tubing, which is considerably lighter than the copper rod, cheaper by a big margin because the price is figured according to the weight, and offers the same rigidity and strength as the rod.

If you can find room for this bit of chatter in your magazine, would also like to offer a suggestion to the users of spark coils. I am in a very congested district as far as radio is concerned and there are numerous spark coils at it hot and heavy continually. The most objectionable practice these fellows have is the adjusting of their sparks with the aerial switch thrown on the sending side. Why in the name of Jake these fellows can't omit the aerial part when they are adjusting their sparks is more than I can figure out. It's enough to drive a man to "drink" to sit there and listen to that constant spluttering and spitting of a half dozen spark coils trying to get their sparks clear. If some of the fellows who use spark coils would bear this suggestion in mind it would help to relieve the QRM considerably and also the general feeling that the fellow with the spark coil is a pest.

With best 73's and wishes for the continued success of QST, I am

Yours very truly,
Frank A. Maher, 2RM.

FROM A YOUNG AMATEUR

Alameda, Cal.,
January 18, 1921.

Editor, QST:—

I have just finished setting up my Three Panel De Forest set which I am very much pleased with. I am very proud, as all amateurs are when we get our first set. It is the pride of the neighborhood. All my friends are very much interested—most

of all their mothers. Talk about curiosity killing the cat, my cat is nearly dead and the dog too, from curiosity.

I have been getting my outfit together for some time, so on the fifteenth of January, it was finished.

On the sixteenth I listened in and Lo and Behold! I heard "All right, boys, in 40 minutes you will hear me talk again." (How romantic) My heart jumped for joy! For I recorded a radio phone message in the first day! Think of it! A little later I heard "All right, try the other coil."

Then at six o'clock I heard a fellow sending when all of a sudden (you have all heard a killdeer wakened from a nap) Bang! That's just what it sounded like only it was very high pitched. Like this Tee! Tee! Tee! Then he would stop and start in again every minute Tee! Tee! I sympathize with The Old Man about fellows chewing up the ether. I would dislike to have been up there then! Gosh!

This first fellow, goodness knows how long he must have been sending before my galena started to work. But anyhow, he kept it up for about an hour.

It sounded like he was giving a dictation. But every now and then the second fellow would start his little piece. It sounded very funny to a ticklish fellow. I will admit I did laugh.

The next night I heard a somebody sending nicely when suddenly somebody who must belong to Art Hickman's Jazz Band—speed and jazz, nobody can compare with him. So this is the end of my little plea to the commercials and amateur operators. I hope we all agree. I thank you for your good attention and here are your ears (or phones) which I loaned from you.

Sincerely,

The Amateur and Stenog.

Words by the Amateur,—Penmanship by Will Ward.

HOOK THIS TO YOUR BULB

Marion, Mass.

Editor. QST:—

You fellows that have been hollerin' grounds, water pipes, wash boilers, bath tubs, gas pipes, etc. Why wouldn't it be a good idea to tune your ground system up a bit, same as you do your antenna? You wouldn't think of putting up seven or eight antennas of different lengths and trying to tune 'em all to one wave length with one O. T., would you? Well, then why do it with your ground system? The current is bound to be absorbed by the connection that comes nearest 200 or whatever your emitted wave is.

If you have seven wash boilers in the ground, get busy and insulate each lead to said wash boilers and insert an inductance in each of the seven leads—time 'em up, each separately, till the highest

radiation is obtained—make 'em all equal so that when your ground does take hold it will be with an even wallop on each lead, same as a counterpoise. This will bring a lot of you fellows from the "just-about-hear-'em class" to one of the "husky fellers." Try it.

If you have a ground up in the next block, which is rotten, (ask the Old Man) put a series condenser in the lead. It's logical.

Yours truly,
1HAA.

CIRCUIT CORRECTION

198 King George St.,
Editor, QST:— Annapolis, Md.

Referring to the circuit for "Radio-Frequency Amplification with A-P Tubes" on page 26 of January QST: Permit me to say that somebody made a slip on that diagram. As shown, the full voltage of the B battery is applied between the grid and filament of the detector tube. Of course that is wrong. The fault can easily be remedied by putting a condenser in the grid circuit of the detector tube. If a grid leak is required, it should be run directly to the filament circuit instead of just bridging the grid condenser. If the grid leak bridges the grid condenser the full B battery voltage will be applied to the grid leak. With any ordinary leak this would be pretty sure to make the grid voltage of the detector too high.

The circuit shown (after correcting as above) will probably be found to have both the advantages and disadvantages of very sharp tuning. If still sharper tuning is desired it can be obtained by making C larger and L correspondingly smaller if the effective resistance of the circuit formed by L, C, and the connections from L to C is made very low.

Respectfully,
J. D. Robinson.

Asst. Prof. Dept. E.E. & P., U. S. Naval Academy.

NEW KINDS OF QRN

944 Washington Ave.,
Bronx, New York.

Editor, QST:—

I read with interest in the December issue of QST, an article by C. C. Endly in reference to a peculiar form of interference with which he has met and notice that apparently he has arrived at a conclusion that this interference is not caused by atmospheric conditions.

I am a commercial operator and, having been on the Atlantic and South American runs for the last three years, have given a good deal of attention to the different forms of static encountered in wireless work.

This form of interference which Mr. Endly mentions was met with while I was in Halifax during the month of January and continuing until the latter part of April, during which period frequent discharges lasting from 1 to 5 minutes were heard. A case indicating the intensity of these disturbances can be best illustrated by stating that during the month of February while in communication with (VCE) Cape Sable, N. S., wireless work was practically impossible for hours at a time, the discharges occurring in such rapid succession. After midnight, however, the air was perfectly clear again. Other operators to whom I later related the case, stated that doubtless it was caused by the Aurora Borealis that was unusually bright at the time.

On my last trip north from Buenos Aires when approximately 700 miles east of Miami, Florida, the temperature being about 80 degrees, we were troubled several times with the same interference and again when off Norfolk, Virginia.

In conclusion, I would like to state that to my mind this interference is due to some atmospheric disturbance but as to its cause I would not venture an opinion. A curious feature in regard to the discharges is that they have invariably taken place on a clear night and previous to a change of moon.

I would like to hear from Mr. Endly in regards to this problem, which is certainly an interesting one.

Respectfully yours,
C. W. Vollmer.

RE: RADIO HUMOR (Example Below)

To Readers QST Magazine
Suffering From Bum Humor,
Hon. Gents:—

Now that Xmas paper QST is finished read, and Hon. Old Man has reply to Hon. Squirt, with bum humor, I therefore send you this Hasty Delivery letter (price 10c) in which Japanese Reader make quick extortation regarding humor explayed by Hon. Old Man and Mr. Squirt, not mention Hon. Kruse, Hon. Vermilia, and other meaning-wellers.

Firstly, I should like to ask for why Hon. Old Man want to bring Govt. politics in argument between Hon. Squirt and himself? Every 23½ hrs., I read in newsless papers of town all about Ohio fight and have now faced music of Candidates with resigned soul. Since Party of Efficiency has landed in White House, Hon. Americans have to take what comes, and sooner Hon. Harding is collected in W. House and Hon. Wilson finds Home in high-up Wash. D. C., all will be well. So, I ask, for why did Hon. Old Man bring in stale humor?

With reckless abandon of Hon. Cash

of realm, I spend ten (10c) cents to ask you, Hon. Editor, why Readers of Great QST magazine have to be induced to bum humor explayed by above Hon. Gents. Friend Wife, which is name for lady who cooks rice and handles DX while operator eats, asks me for why Hon. Cat has to be moistened every time Hon. Old Man makes noise and fuss? In days before United States was made safe for Democrats, Hon. Old Man had radio club in which members contained were Hon. Radical, Hon. Final Authority, and others . . . For why, I write a letter, do Mr. Old Man bring in those of Ancient Cave-man time? Present time demand quick and original joke, not Hon. ressurrected name. Once before, I write question to Hon. Editor QST magazine, which tells all about radio, asking where charge of condenser go when plates taken apart. Now, this Question is puzzle me quite!, but when publish in QST magazine on paper, Hon. Readers make large fun of same Question. This was consider highly intellegently humor by members of Hon. A. R. R. L. when sent in by poor Japanese radio buglet hunting for Hon. radio information. This Question was answer by many Hon. Experts which same divulge to me for whv charge remain on plates, with sparkle of humor. If Hon. Old Man is continue bum humor jokes and writings to Hon. Squirt poor Japanese school-boy, which is now marry, will consider asking same question over again. To heln Hon. readers of QST magazine, which has help more infortunates men in exploitation of radio signals through Hon. Air, I fill myself with duty and write above request for pipe-down on Hon. Cave-man humor which same is denote by Stone Age time, and ask to print more Calls Heard of stations or give picture photo of Hon. Maxim to fill up extra collums in magazine.

Hon. Vermilia seemingly funny man to children in pants short, but for man who is marry, same humor explayed by him is horrible example of Hon. Bud Fisher or Hon. Goldberg when same Hon. Gents are sober. Hon. Kruse which same is in Standard Bureau is no more funny since he took up job to find why Hon. Signals pass out on way to other stations. He is now Hon. Fader Expert. Hon. Warner's compartment which is label "Strays" contain more information regarding Signs of Times than humor, but when Hon. Reader get through perusing this compartment, he is laff more than 3 articles by Hon. Old Man, or Hon. Squirt.

Secondly and lastful, I should like ask for why Hon. Old Man write anyway? To poor deluded Jap which is try invest tips money in best advantages such as Food, Knock-down condensers (which same he is

unable to knock-up) and QST magazine, this appearingly excellentful humor ex-played by Hon. Old Man is blow to tickle-bone, latter persplained to me by physician doctor as place where good joke take effect, and to me seems useful in Hon. Turnsback's newsless paper which is full of Mexicanese air. Conclusionly, I write to say, Hon. Editor, whose varnished brain is able explain numerously intricate problems to me through collums of QST pamphlet, that Hon. Readers, including Hon. E. E. House, be spared by resulting bum humor of Hon. Old Man, Hon. Ver-milia, Hon. Kruse, Hon. Wolfe and others radio bugs which is now got funny writings to send in.

Hoping you ar the same,
"FISHMARU HOBO."

LARGE HOLES IN PANELS

26 Highland Ave.,
Akron, Ohio.

Editor, QST:—

I believe I have hit upon a scheme which the fellows who build their own apparatus will appreciate.

I think that any one who has tried to cut a round hole an inch or more in diameter in Bakelite or hard rubber has found a big job on his hands.

I have found that an ordinary leather washer cutter used to cut round leather washers, is just the thing. It can be adjusted for various size holes and can be purchased at any hardware store. It fits into the ordinary wood brace.

By cutting half way thru on either side of the panel, a neat absolutely round hole can be cut. If the cutting edge is kept sharp it will not leave any unsightly burr on the surface.

Have also found that common white bath tub enamel when thoroughly dried makes a neat and cheap way of engraving a panel. It is not necessary to scratch the panel before applying the enamel. It can best be applied with a draftsman's ruling pen.

Respectfully,
A. S. Bachtel, 8IQ.

SCRANTON'S QRM

Toronto, Ontario,
5 Wells St.

Editor, QST:—

I read with interest a letter from Mr. P. O. McFarland on the subject of a peculiar QRM. I think Mr. McFarland will find that this "noise" is caused by the charging of the electrolytic lightning arrestors at the power stations in his city. We have the same trouble here, and get the same QRM anywhere from 200 to 4000 meters and it drowns out everything else. I have known it to last three or four hours. We

can't do anything but wait until it is finished. The length of time depends upon the size in KV-A of the arrestor and the number in the bank. They are generally charged every night and work on the same principle as Dr. Radio's water and aluminum kick-back preventor. I am very sorry that nothing can be done to get rid of it, really the only thing Mr. McFarland could do would be to get the company to put in another type of arrestor, but I can't see them doing it. Not in our locality anyway. Hoping this may throw some light on the topic, I am

Yours very truly,
W. R. Carruthers, 3CE.

SPARK COILS

Kountze, Texas.

Dear Editor:

I would like to see spark coils come into greater use as short range transmitters. Most writers when referring to a spark coil transmitting set generally give instructions for a condenser and helix only, while the "ham", who causes so much trouble and prejudice against the spark coil, generally connects the spark direct in the aerial circuit. Neither of the above methods is efficient and it is hard to obtain a pure wave by using any other method than the oscillation transformer. While the helix may give a better radiation, that does not indicate its probable greater range. It is easy to see why a receiving station can get louder signals from a certain transmitter if all the energy is on one wave instead of being distributed over different tunes.

Last January I was using a half-inch spark coil in the standard O.T. hook-up with two cartridge shells for a spark gap, home made O.T. with ordinary white pine insulation, and standard Murdock spark coil condenser. A 6-volt storage battery furnished the "juice". I used a 6-volt battery lamp for a hot wire ammeter and tuning only with this as a guide, I got resonance on about 200 meters and with the bulb a little brighter than a bright glow. At best glow the spark gap was as short as possible without continually shorting while sending. This gives good quenching and full coupling can generally be used. The vibrator should be adjusted to give very low, smooth note. With this arrangement, on a single 100 foot wire 50 feet high at one end and 15 feet at the other, I have been repeatedly heard in Houston, a direct distance of 73 miles, and all on about 6 watts input. This shows what can be accomplished with a spark coil and by sharp tuning. To show what little total energy was being radiated the flashlight bulb was direct in the aerial circuit without a shunt or any other thing to keep it from burning out. A. P. Daniel first re-

ported me weak and SHARP. Later, H. E. Worthington, 5BS, now 5ZV, wrote me a card saying he had heard me several different nites and he was quite sure 5YA got me also (I had a few nites previous called 5YA and upon having trouble with VT just got his QRA? so I didn't know for sure whether he answered ME or not) for he had answered my calls once. That is 125 miles away. Freak work of course, but so are the majority of other records by transformers, etc. With a better aerial, in winter, this should be repeated often.

Yours truly,
Arden Hooks, 5BB.

GENERATORS FOR C.W.

137 Hill Avenue,
Highland Park, Detroit, Mich.

Editor, QST:

Just a few lines to those amateurs who are experimenting with C.W. transmitters and who have difficulty in getting a source of high voltage for plate. I have picked up, from time to time, second handed motors which function perfectly as generators for high voltage. I have found several 220 volt, shunt wound low speed, 900 to 1200 rpm., D. C. motors which when coupled direct to an 1800 rpm. induction motor gave 450 volts and all the amperage required. Both motors are rated at 1/10 to 1/8 H. P. Using this in connection with 1 W.E. VT-2 I get a radiation of nineteen-tenths ampere with which I have worked Boston and many other eastern stations very Q.S.A. The generator and motor usually can be picked up for \$20.00 each and it makes an excellent motor-generator set for the Amateur. I am giving you this information because I believe many Amateurs believe that it is necessary to spend a great deal of money for a motor-generator set before they can take up C.W. No trouble was experienced with commutator hum even on generators having only 16 segments in commutator.

Yours very truly,
Clyde E. Darr, 8CB.

GIVE HIM THE CELLULOID POKER

Ex 3AMP,
Baltimore, Md.

Dear Eddy:

How's this for the prize "ham" stunt of the year? The other day a very nice young operator blew in on us and wanted a "honeycomb" coil to receive 2500 meters. After he had purchased same, he asked if I could supply him with the "info" as to why the tuning coil that he had made would not work. He said that he knew that it was O. K. because he had looked in his arithmetic book and found that a meter is approximately three feet. (?) Therefore said Ham wound 7500 feet of No. 26 on a

form. He was very indignant when I told him it was ALL WRONG.

If that bird doesn't get the cut glass golf ball, call me a "squeak-box" pounder.

As ever,

J. Holloway.

RADIO IN THE ARGENTINE REPUBLIC

Reconquista 46,
Buenos Aires, Argentine.

Editor, QST:

The writer, having read many articles in current radio publications on the very desirable outlets for American radio products in the South American countries, wishes to make clear on what footing wireless activities stand in one of the most if not the most progressive country in the Southern Hemisphere.

Radio in this great republic may be classed in three divisions: amateurs and private installations; ship-to-shore stations; and last but not least, the high powered installations for world-wide communication.

The first division, or amateur class, undoubtedly embodies the greatest field for the American manufacturer of amateur and commercial apparatus, for it is here that the rapid growth of interest in wireless affairs will show itself first.

At present there are but thirty officially licensed amateur stations, but this number would be increased very considerably were it not for the fact that every piece of apparatus, however small, must be imported, and of course the ruinous import taxes make apparatus just double its original price. When one takes into consideration that Argentine paper money is valued at a little less than one-half United States gold, it may be seen the installation of an amateur radio set is more a matter of money than anything else. Although amateurs here are still restricted to a transmitting input of fifty watts, and a transmitting wave length of three hundred meters, it is hoped that in the near future the amateurs will be allowed to use more power at a reduced wave length. In consequence of this low power input, radio telephony and continuous wave transmitters have been the rule, rather than the exception, this being the case even in the years before the Great War.

The second class, or ship-to-shore traffic, is handled in about the same fashion as in the United States, LIA, the government radio station at the North Basin, here in Buenos Aires, being the chief center for all traffic for the Republic.

Now we come to the third class, or high powered world-wide-stations. There are three companies actively engaged in the erection of high powered stations, namely: Compania Marconi del Rio de La Plata; The Pan-American Radio Telegraph & Telephone Company; and the "Trans-

radio Compania Radio Telegrafica Argentina S. A. Besides these three the French Radio-Telegraphic Company has just applied to the Ministry of Marine for permission to install an ultra-powerful radio station.

The Radio Corporation of America has already started work on its stations at Maschwitz and Lujan, just outside of Buenos Aires. These transmitting stations will obtain their power from a central power house in which will be installed at least three and probably six Alexanderson alternators. The U. S. Government station NFF is conducting daily tests to determine the best sites for the corresponding receiving stations, as static conditions in this country are very bad. In fact the Transradio Compania Radio Telegrafica is spending a great deal of time and money trying to locate a place in the Argentine where static conditions are at a minimum, but so far has been unsuccessful. This company is erecting a transmitter of the Nauen type of 400 K.W. and expects to complete the installation by the first of 1922.

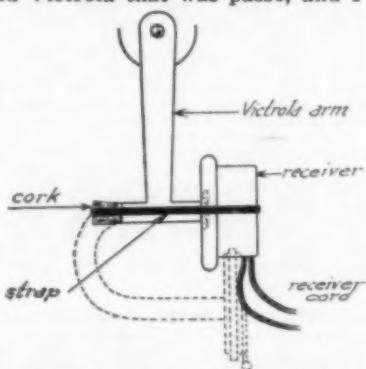
In concluding, the writer wishes to state that he will be very pleased to furnish further information to any one writing to him at the above address.

Yours truly,
Wallace A. Heckman, 1AA.

A SIMPLE LOUD-TALKER

236 Burns Ave.,
Detroit, Mich.

Editor, QST—
I dropped a pair of Baldwin phones the other day, and one now refuses to respond. So I thought maybe I could use the other in some way. The loud talking apparatus, now so expensive, presented itself. I had an old Victrola that was passe, and I took



the sound-box off, and strapped the single good Baldwin to the end of the tube, and turned on the set. Signs came in better than ever before. The swivel arm with its horizontal axis was removed, and a cork put in one end and the receiver on the other, as the sketch below shows:

The dotted lines outline the parts to be

removed, while the solid lines show those in use and how to attach the phone.

Hoping this may be of some help, I am

Yours truly,
M. Crosby Bartlett, 8MC-“B”.

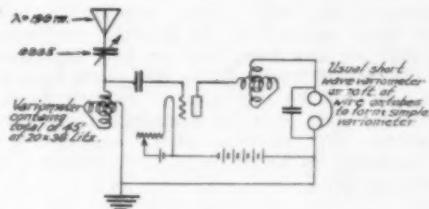
A SIMPLIFIED CIRCUIT

108 Pine St.,
Millville, New Jersey, 3AAN.

Dear Eddy—

Recently so many fones have started up a fellow sprains his wrists trying to hear both sides of a conversation when adjusting any of the well known regenerative sets. Well you know. A fellow may be strong, healthy and willing but an hour's work trying to get an earful of what two fones are saying will floor him all right. I have tried a number of circuits but found the one below the easiest to adjust and still obtained good amplification.

Using 45 ft. wire in form of a variometer for aerial inductance and shorting series condenser will cause circuit to respond to 700 meters using an aerial of 190 meters.



In order to make this circuit oscillate use minimum capacity (series) and max inductance. To receive waves of 200 it is necessary to use variometer near minimum and also series condenser near min. The circuit will not oscillate unless very small series capacity is used, due very likely to aerial absorbing energy too rapidly. Rapid adjustment can be had solely by the variometer rotation and no troublesome adjustment of coupling as when a regular set is used. It is very selective on the lower waves but not not on the tunes above 300. This is due to the small capacity necessary for short waves. I use as low as .0001 for 200 and get very good signs. To amplify waves over 350 it is necessary to place one variometer to feed back but on 200 there should be no coupling between variometers.

This circuit is as sensitive as any short wave set on the market but not as selective, of course. Stations are heard every evening in every district except the 6 and 7. Strange to say local induction from arc lights is not as bad as on sets of the Paragon or Grebe type.

Yours truly,
Geo. P. Hamilton.

CALLS HEARD

In addition to the following instructions please read references to this section on pages 30 and 58 in February QST.

(1) Typewrite or neatly print the calls, "double-spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of the paper.

(2) Arrange alphabetically thru each district, from 1 to 9, with no break between districts, using commas to separate items and putting parentheses around calls of stations also worked—all as per the lists below.

(3) The period covered by the report shall be from the first of one month to the first of the following month. All lists must be received by us by the 10th of the second month, for publication in the next following QST.

If you will co-operate with us in this, no calls published will be over two months old, and their value will be greatly increased in that we can keep tab on how improvements in our transmitters are working out, etc. It will be our aim to publish representative lists, equally distributed over the country; and in general to conduct this department so as to be of the highest possible service.

HEARD AT SEA

Operator, WKV, Jan. 28d, 200 miles east of WSC, on crystal: 10E, 2TF, 3AHK, 3DH, 3NC, BDW, 8XK, 8ZL.

Operator, WKG, reports heard Jan. 22d, 130 miles west of Sand Key (Key West, Fla.): 2JU, 2RK, 3CS, 3DH, 3HG, 3RK, 4AN, 5BI, 5DO, 5EJ, 5FL, 5HI, 5JE, 5XB, 5YE, 5YL, 5ZA, 5ZK, 5ZX, 8HG, 8LR, 8XK, 8ZL, 8ZR, 8ZW, 9AAC, 9AEQ, 9CA, 9EL, 9LA, 9LR, 9OX, 9PS, 9UU, 9YM, 9ZH, 9ZN, 9ZR.

Operator, KDEV, in Tampico, Mex., January; 5ZX, 4ZC, 5ZG, 5EJ, 5ZT, 5ZA, 5IS, 5HL, 5JS, 5BI, 5ZK, 5JM, 5ZS, 5ZV, 5XB, 5FL, 5EA, 5JE, 5ZU, 5YH, 5BR, 5JT, 5LR, 5LS, 6IG, 8GN, 9AE, 9YY, 9LR, 9EL, 9OE, BCO.

ITS, BRISTOL, CONN.—Jan. 1 Tube.
 1AB, 1AB1, 1AB2, 1AE spk. & C.W., 1AO, 1AR, C.W., 1AB, (IAW), 1AZ, 1BAB, (IBBL), 1BL, 1CBX, 1CX spk. & C.W., 1CM, 1CP, 1CR, 1CY, (1CZ), 1DA, C.W., 1DAP, 1DBM, 1DR spk. & C.W., (1DY), (1AE), 1EAT, (1EAV), (1EBW), 1EN, (1EP), 1ES, (1FBF), 1FL, 1FQ, C.W., 1FU, 1FV, (1GAI), 1GAW, 1GBC, 1GBL, 1GBT, 1GJ, 1GM, 1GY, 1HAA, 1HAF, 1HBA, 1IHD, 1IZ, 1JAR, (1JBF) spk. C.W. & fone, 1JBT, 1JD, 1JQ, 1KAG, 1KAQ, (1KAZ) spk. & C.W., 1KBJ, 1KM, 1LAX, 1LBR, 1LJ, 1MAD, 1MB, 1MBS, (1NAQ), (1NAT), 1NO fone, 1OAD, (1OBH), 1OE, 1OJ, 1PBA, 1OG, 1QN, 1QT, (1RAY), 1RV, 1RZ spk. & C.W., 1TAQ, (1TAZ), (1UD), 1UL, 1VAA, 1VAR, 1VE, 1WJ, 1WR, 1XE, 1XM, (1XN), (1XT), (1XV) C.W. & fone, (1XX) C.W., (1YB), 2AFF, 2AAX, 2ABM, 2ACB, 2AEF, 2AEP, 2AGC, 2AID, 2AIM, 2ARA, 2ARY, 2AXB C.W., 2AZP C.W., 2BB, 2BE, 2BEH, 2BGM C.W., 2BGR, 2BIP, 2BK, 2BM, 2BO, 2BZ C.W., 2CC, 2CS spk. & C.W., 2CT spk. & C.W., 2DA, 2DE, 2DI, 2DK, 2DN, 2DR, 2EL, 2FD, 2FG,

2FS C.W., 2GR, 2GU, 2HJ, 2HN, 2HZ C.W., 2IG, 2JJ, 2JN, 2JU, 2JZ, 2KQ spk. & C.W., 2KY C.W., 2LO, 2MP, 2NN, 2RM, 2RQ, 2RR, 2SS, 2SU, 2SZ, 2TB, 2TF, 2TS, 2UE, 2VA, 2VZ, 2WD C.W., 2XG C.W., 2XJ fone, 2XQ spk. C.W. & fone, 2XX C.W., 2YM, 2ZC, 2ZD spk. & C.W., 2ZL C.W., 2ZM, 3AAE C.W., 3AB, 3ABC, 3ABG, 3ACM, 3AHK, 3AC, 3AK, 3BE, 3BG, 3BP, 3BZ, 3CC, (3DH), 3DR, 3DS, 3EN, 3FM, 3FR, 3GO, 3GX, 3HB, 3HG, 3HJ, 3HV, 3HX, 3IW, 3LS, 3NB, 3OB, 3PB, 3PU, 3QV, 3QW, 3RW, 3UC, 3UF, 3UX, 3VV, 3XC, 3XF, 3YH, 3YV, 3ZE, 3ZS, 4BY, 4XB C.W., 3AAV, 3AB, 3ACF, 3AD, 3ADV, 3AEE, 3AFM, 3AF0, 3AGB, 3AGK, 3AGO, 3AJW, 3AKA, 3AKJ, 3AL, 3ALE, 3ALY C.W., 3AMF, 3AMQ, 3AMZ, 3ANK, 3ANO, 3ANT, 3AO7, 3AP, 3APB, 3APH C.W., 3ARK, 3ARW, 3AY, 3BB, (3BC), 3BG, 3BO, 3BP, 3CAA, 3GG, 3CP, 3CQ, 3DC, 3DJ, 3DR, 3DT, (3DV), 3DY, 3FA, 3FE, 3FK, 3FN, 3FT, 3GI, 3GR, 3GW, 3HG, (3HP), 3ID, 3IK, 3IL, 3IV, 3IZ, 3JJ, 3JP, 3KD, 3KF, 3KH, 3KK, 3KM, 3KP, 3KU, 3KZ, 3LF, 3LG, 3LI, 3LM, 3LQ, 3LU, 3LV, 3MF, 3MH, 3ML, 3MP, 3MZ, 3NI C.W., 3NQ C.W., 3NZ, 3OI, 3OJ, 3OY C.W., 3OZ, 3PU, 3QJ, 3QM, 3RI, 3RQ, 3SH, 3SP, 3TT, 3UC, 3UO, 3VJ, 3VQ, 3VS C.W., 3VU, 3WY, 3XE, 3XH, 3XX C.W. & fone, 3XS, 3XU, 3YA, 3YD, 3YF, 3YK, 3YR, 3YV, 3ZA, 3ZD, 3ZE, 3ZG C.W., 3ZI, 3ZL, 3ZQ, 3ZR spk. & C.W., 3ZV spk. & C.W., 3ZW spk. & C.W., 3ZY, 3ZC, 3AAC, 3AAW, 3AAV, 3AIX, 3AU, 3BB, 3BP, 3CA, 3EQ, 3GP, 3HM, 3HY, 3JN, 3JQ, 3KL, 3KV, 3LM, 3LQ, 3LR, 3OX, 3PV, 3UH, 3UU, 3WE, 3XI C.W., 3XM spk. C.W. & fone, 3YA, 3YB, 3YC, 3YL, 3YM, 3ZB, 3ZJ, 3ZL, 3ZN, 3ZY C.W. & fone, 3NSF C.W. & fone, 3WW.

1CK, BRAINTREE, MASS., Jan. 1-22
 (1AK), (IAW), 1BB1, (1CM), 1DAC, 1EK, (1EAV), (1FV), (1GBC), (1HAA), (1OE), 1OW, (1RAY), 1TS, 1UQ, 1XF, (1XX), (1YB), 2AAE, 2AAX, 2ACM, 2AER, 2AID, (2AR), (2ARY), (2BB), 2BH, (2BK), 2BZ, 2CM, 2DA, 2DI, (2DN), 2E, 2EL, (2HN), 2JJ, 2JN, (2JU), (2JZ), 2KK, 2LO, (2OA), (2OM), 2OO, (2RB), (2RK), 2RL, (2RM), 2SH, 2SQ, 2SZ, (2TF), 2UE, 2UK, (2VA), (2XX), 2YM, 2ZD, 2ZL, 2ZM, 2ZR, 3ABC, 3ACM, 3AHK, 3AIB, 3AIS, 3AK, 3BG, 3BH, 3BP, 3BZ, 3CC, 3CL, (3CM), 3CO, 3DC, (3DH), 3DR, 2DS, 3EE, 3EH, 3EK, 3EN, 3FM, 3GB, 3GO, (3HG), 3HX, (3KM), 3KV, 3LS, 3NB, (3OB), 3OU, (3PU), 3ST, 3UC, 3VV, 3XF, 3YH, 3ZA, 3ZE, (3NSF), 4AG, 4BY, 4EY, 4DA, 4YC, 5ZP, 5ACF, 5ADV, 5AEP, 5AFB, 5AIB, 5AIQ, 5AJW, (5AKA), 5AKJ, 5AMZ, 5ANJ, 5ANT, 5AOE, 5AP, 5APB, 5ARW, 5ASU, 5AU, 5BB, 5BO, 5BV, 5BV, 5CG, 5DC, 5DI, 5DJ, 5DR, 5DV, 5EV, 5FA, 5FK, 5FW, 5GI, 5GW, 5HP, 5KZ, 5LF, 5LH, 5LI, 5LM, 5LQ, 5MZ, 5NI, 5NL, 5NZ, 5OI, 5PI, 5QM, 5RA, 5RQ, 5SP, 5TB, 5UH, 5UJ, 5VJ, 5VW, 5WY, 5XH, 5XK, 5XU, 5ZA, 5ZD, 5ZE, 5ZL, 5ZR, 5ZW, 5ZX, 5ZY, 5ZZ, 5AH, 5AU, 5CA, 5EE, 5EQ, 5KO, 5LM, 5LQ, 5PV, 5UH, 5UU, 5WE, 5XM, 5ZJ, 5ZL, 5ZN.

1ID, LYNN, MASS., Jan. 1-18
 (1AK), (1AW), 1CM, 1GZ, (1OJ), (1UD), 1OE, 1XT, (1XX) C.W., (1YB), (1DAB), (1BB1), 1BAB, 1FBF, 1GBC, (1HAA), (1RAY), (1VAA), 2AR, 2BK, 2DA, (2DN), (2EL), 2GR, 2IM, (2JU), (2JZ), 2LO, (2OA), 2OM, (2RK), 2SU, (2TF), 2RL, 2ZD, 2ZL C.W., 2ZM, 2AER, 2AAX, 2AJW, 2ARA, 3AB, 3BG, (3BZ), 3CC, 3CO, (3DH), 3DO, 3DS, (3GO), (3HJ), 3HX, (3KM), (3PU), (3UE), 3UC, (3VV), 3QW, 3XU, 3ZE, 3ACM, 3YH C.W., 3ABC, 3AHK, 3AB, 3CF, 3CW, 3DE, 3DR, 3FU, 3GI, 3GW, 3DV, 3HA, 3HG, 3HY, (3ID), 3IK, 3JS, (3KE), 3LM, 3LV, 3NM, 3OJ, 3PT, 3PU, 3FU, 3QM, 3SP, 3XK C.W., 3XE, 3WY, (3ZD), 3ZL, 3ZR C.W., 3ZW, 3ZV, 3AAZ, 3AGY, 3ARK,

8ARW, 8CAA, 9CA, 9GV, 9OX, 9WO, 9LM, 9LQ, 8ZJ C.W., 9ZL, 9ZN, (NSF).

1FW, BRIDGEPORT, CONN., Jan. 6 to Feb. 12. 1AW, 1BBL, 1CAS, 1DY, ((1FAQ), 1FL, 1FM, 1GAS, 1GAX, 1HAA, 1JBC, 1JBN, 1JQ, 1NBBG, 1OE, 1QN, 1RAY, (1RZ), 1TL, (1UAW), (1VAA), 1VBC, 1WAB, (1XN), 1XT, (1XX), 1YB, (2ABM), 2ABT, 2ACS, 2AE, 2AER, 2AGS, 2AHL, 2AID, 2AJF, (2AJW), 2AMR, (2AXB), 2AV, 2BF, 2BG, (2BGR), 2CS, (2CT), 2DA, (2DI), 2DN, 2DR, 2DT, 2EK, (2EL), 2FD, 2FS, 2GR, (2HJ), 2HK, 2IF, 2JIN, 2JJ, (2JU), 2JV, 2JZ, 2KQ, (2KY), 2LZ, 2OA, 2OI, 2OM, 2ON, 2OV, 2QR, (2RB), 2RK, (2RI), 2RQ, 2RR, 2SH, 2SP, 2SZ, 2TF, 2TK, 2UC, 2UE, 2UK, 2VA, 2VC, (2VD), 2XEN, 2XL, 2XP, (2YM), 2ZC, (2ZD), 2ZL, 2ZM, 2ZV, 3AFK, 3AHK, 3AK, 3BG, 3BH, 3BZ, 3CC, 3CO, 3CV, 3DH, 3EN, 3GO, 3GX, 3HC, 3HJ, 3HV, 3KM, 3KV, 3NB, 3ND, 3OU, 3PU, 3UC, 3QE, 3QR, 3SW, 3TW, 3XF, 3YV, 4FF, 4FR, 4OV, 4XR, 4XC, 5DA, 5KP, 5AAW, 5ABL, 5ACF, 5AD, 5AFO, 5AIO, 5ANK, 5APR, 5AT, 5ATN, 5AR, 5BC, 5BP, 5CG, 5DI, 5DL, 5DV, 5DR, 5FG, 5FN, 5FT, 5GI, 5GT, 5GW, 5HA, 5HG, (5HP), 5JE, 5JO, 5GO, 5KK, 5KZ, 5MF, 5MN, 5MZ, 5NN, 5OJ, 5PN, 5PT, 5RI, 5RP, 5RQ, 5SL, 5SP, 5SR, 5TT, 5VJ, 5VQ, 5VW, 5WY, 5XE, 5XH, 5XK, 5XU, 5VG, 5ZA, 5ZE, 5ZD, 5ZG, 5ZIA, 5ZL, 5ZR, 5ZV, 5ZW, 5ZY, 5AU, 5GO, 5IM, 5ND, 5ZJ, 5ZL, 5ZN.

2TT, NEW YORK CITY, Dec. 3 to Jan. 29. 1AK, 1AS, 1AW, 1BBL, 1BBL, 1CK, 1CY, 1CZ, 1DY, 1EAV, 1EBW, 1EP, 1ES, 1FV, 1GAL, 1GBC, 1GBT, 1GM, 1HAA, 1JAP, 1LAX, 1OE, 1OW, 1RAY, 1TS, 1VAA, 1XN, 1XT, 1XX, 1YB, 2BB, 2BM, 2DA, 2SZ, 2TF, 3AAE, 3AB, 3ABC, 3ACI, 3AM, 3ACX, 3AHK, 3AIB, 3AIC, 3AQK, 3BG, 3BH, 3BO, 3BZ, 3CK, 3CM, 3CV, (3DH), 3DS, 3EN, 3FG, 3FR, 3GO, 3GX, 3HG, 3IJ, 3IH, 3KM, 3LS, 3LY, 3NB, 3OC, 3OU, 3PU, 3RV, 3UC, 3UF, 3VV, 3XC, 3XF, 3YV, 3XA, NSF, WWV, 4AG, 4FF, 5XA, 5YH, 5AAZ, 5AB, 5AD, 5ADA, 5ACY, 5AGO, 5AJW, 5AKA, 5AL, 5ARW, 5AY, 5BQ, 5CG, 5CH, 5CV, 5DP, 5DR, 5DV, 5EF, 5EV, 5FAA, 5FK, 5FT, 5GB, 5GI, 5GW, 5HG, 5ID, 5IK, 5IV, 5JF, 5JJ, 5KE, 5LF, 5LI, 5LM, 5MF, 5MG, 5NZ, 5OJ, 5OI, 5OZ, 5PI, 5PQ, 5RQ, 5SP, 5TT, 5UP, 5VJ, 5VQ, 5WY, 5XE, 5XH, 5XX, 5XU, 5ZA, 5ZD, 5ZE, 5ZL, 5ZR, 5ZV, 5ZV, 5ZY, 5ZV, 5AAW, 5AP, 5AU, 5AWX, 5CA, 5EQ, 5GC, 5HJ, 5JN, 5QJ, 5KN, 5KV, 5LQ, 5LR, 5OC, 5UH, 5XM (C.W.), 5ZJ, 5ZL, 5ZN, 5MS, (5ZW, 5PK, C.W. & fone).

2KV, RRONXVILLE, N.Y., January. 1AW, 1BBL, 1CBJ, 1CK, 1CM, 1CZ, 1DY, 1EBW, 1EP, 1HAA, 1IBD, 1IR, 1OE, 1WR, 1RAY, 1XF, 1XX, 1YB, 2SZ, 2TF, 3ABC, 3ACM, 3ACS, 3AD, 3AHK, 3AK, 3BG, 3BP, 3BR, 3BZ, 3CC, 3CO, 3DH, 3EN, 3FG, 3GO, 3HG, 3HH, 3HJ, 3HX, 3IB, 3KM, 3NB, 3ND, 3OB, 3OU, 3PB, 3UC, 3UX, 3VV, 3WL, 3XC, 3XF, 3YV, 3ZE, NSF, WWV, 4AG, 4BY, 4CM, 5AAZ, 5ACF, 5AD, 5AEE, 5AGO, 5AGQ, 5ARW, 5ATS, 5AY, 5BQ, 5CG, 5DR, 5DV, 5DY, 5DZ, 5EV, 5FL, 5GI, 5GW, 5HA, 5HG, 5HP, 5HT, 5HY, 5ID, 5IK, 5JE, 5JJ, 5KK, 5LA, 5LF, 5LI, 5LQ, 5ML, 5MN, 5OI, 5PI, 5PQ, 5PT, 5SH, 5SP, 5UJ, 5VJ, 5VQ, 5WY, 5XE, 5XH, 5XX, 5XU, 5ZK, 5XU, 5ZD, 5ZE, 5ZJ, 5ZL, 5ZR, 5ZV, 5ZY, 5ZV, 5CA, 5CC, 5EQ, 5GN, 5HM, 5HR, 5KV, 5LQ, 5MC, 5TD, 5UH, 5UU, 5WU, 5YB, 5ZB, 5ZJ, 5ZL, 5ZN.

2AEQ, BRONX, NEW YORK, CITY, January. 1AK, 1AW, 1BBL, 1CK, 1CY, 1DY, 1FV, 1GY, 1GBC, 1HAA, 1JG, 1VAA, 1XX, 1YB, 2SZ, 2TF, 3ABC, 2AHK, 3AKV, 3BG, 3BZ, 3CK, 3DH, 3DS, 3EN, 3FR, 3HJ, 3IW, 3KM, 3KU, 3RW, 3UC, 3VV, 3XF, 3YV, 5XA, 5AAZ, 5ACF, 5AFB, 5AGK, 5AGW, 5AJW, 5AKA, 5AKJ, 5AKV, 5ALE, 5AMZ, 5ANK, 5ASH, 5AOI, 5BU, 5DC, 5DR, 5DV, 5EV, 5GB, 5GW, 5HG, 5HJ, 5HP, 5HT, 5HR, 5ID, 5IK, 5IL, 5JE, 5JJ, 5KK, 5LF, 5LI, 5LQ, 5ML, 5MN, 5OI, 5PI, 5PQ, 5PT, 5SH, 5SP, 5UJ, 5VJ, 5VQ, 5WY, 5XE, 5XH, 5XX, (5PK, & fone), 5XU, 5ZD, 5ZE, 5ZL, 5ZR, 5ZV, 5ZY, 5AAC, 5CA, 5CP, 5ET, 5HT, 5JN, 5JL, 5LQ, 5LR, 5UH, 5UK, 5UU, 5ZJ, 5ZN, NSF, WWV.

2AUG, RIDGEWOOD, N. J., Indoor Aerial, Jan. 3RP, 3BZ, 3CO, 3DH, 3GN, 3GO, 3GX, 3HG, 3HT, 3LR, 3OB, 3PU, 3RO, 3SZ, 3UC, 3UF, 3YH, 3ZE, 3ABC, 3ABG, 3AC, 3ACM, 3ALN, 4AG, 4AU, 4FF, 4XC, 5DA, 5FD, 5XA, 4ZA, 5ZC, 5ZU, 5AB, 5AD, 5AS, 5AY, 5CF, 5CG, 5CH, 5CX, 5DE, 5DG, 5DJ, 5DN, 5DP, 5DT, 5DV, 5FT, 5GI, 5GW, 5HA, 5HF, 5HG, 5HJ, 5HP, 5HY, 5ID, 5IK, 5IN, 5JE, 5JJ, 5JQ, 5IS, 5JW, 5KI, 5LI, 5LM, 5LQ, 5JX, 5ML, 5MP, 5MT, 5MV, 5MZ, 5NI, 5NL, 5NM, 5OJ, 5PN, 5PS, 5PU, 5QM, 5QW, 5RA, 5SG, 5SH, 5SP, 5SY, 5TB, 5TK, 5TN, 5TV, 5UK, 5UY, 5VJ, 5VQ, 5WA, 5WR, 5WV, 5WY, 5XE, 5XH, 5XX, 5XU, 5ZA, 5ZD, 5ZE, 5ZL, 5ZR, 5ZV, 5ZW, 5ZY, 5ACF, 5ACH, 5ADV, 5AEP, 5AGB, 5AHR, 5AIG, 5AJB, 5AJW, 5AKJ, 5AKV, 5AMZ, 5ANK, 5ANO, 5ARK, 5ARW, 5CII, 5AP, 5AQ, 5BZ, 5CA, 5EK, 5EQ, 5FS, 5HM, 5HN, 5HP, 5HR, 5IN, 5JN, 5KN, 5KV, 5LM, 5LQ, 5LR, 5MA, 5MH, 5MS, 5SU, 5TW, 5UH, 5VY, 5WU, 5ZB, 5ZL, 5ZN, 5ZZ, 5XM, 5AAV, 5AAW, 5ABL, 5AHR, 5ARB, 5ASL, 5AWX.

3HS, WASHINGTON, D. C., January 1AAY, 1BA, 1BB, 1BBL, 1CK, 1CM, 1CZ, 1DY, 1EBJ, 1FB, 1FK, 1GBC, 1GBT, 1HA fone, 1IR, 1MAD, 1OE, 1OW, 1QY, 1RR, 1RZ, 1RAY, 1TS, 1UF, 1XB fone & C.W., 1XX fone & C.W., 1YB, 2BG, 2BU, 2CM, 2DA, 2DI, 2FZ, 2GR, 2OA, 200, 2QK, 2QM, 2SZ spk, & C.W., 2XQ, 2XX C.W., 2YM, 2ZL, C.W., 2ZM, 3BP, 3CC, 3GL, 3GQ, 3NC, 2PB, 3QW, 3XE, 3YV, 3YV, 3ZU, 4AG, 4AM, 4AU, 4AV, 4BN, 4CA, 4DM, 4EK, 4EY, 4XD, 5AM, 5DA, 5EL, 5IO, 5XA, 5ZP, 5BA, 5AB, 5AR, 5ADQ, 5AEE, 5AEJ, 5ADQ, 5AEP, 5AFB, 5AGK, 5AKV, 5ANP, 5ARW, 5AZI, 5BP, 5BQ, 5BW, 5DE, 5EC, 5EF, 5FD, 5FI, 5FT, 5GJ, 5HJ, 5HK, 5HS, 5HY, 5IC, 5ICF, 5IE, 5IM, 5JL, 5JF, 5KK, 5KP, 5KR, 5KW, 5KY, 5KZ, 5LM, 5MF, 5NY, 5NZ, 5OJ, 5RR, 5RT, 5TD, 5TJ, 5TN, 5TV, 5XE, 5YK, 5ZC, 5ZH, 5ZL, 5ZR, 5AU, 5AAW, 5ABL, 5ABW, 5AFO, 5AHY, 5ARJ, 5AWX, 5BM, 5CM, 5GJ, 5JL, 5PN, 5UK, 5VC, 5XM, 5XU, 5YB.

3EH, COLLINGSWOOD, N. J., January 1AAT, 1AS, 1AW, 1BAB, (1BBL), 1CK, 1CM, 1CZ, 1DY, 1EBW, 1FQ, 1FV, 1GBC, 1GBT, 1HAA, 1IRY, 1JA, 1JE, 1KAQ, 1LAX, 1OE, 1RAK, 1RAY, 1WR, 1XX, 1XE, 1XT, 2AX, 2AR, 2BB, 2BM, 2AIM, 2DA, 2DI, 2DM, 2DN, 2HN 2JU, 2NN, 2RL, 2RK, 2SZ, (2TF), 2ZM, 2ZL, 2ZR, 3ADT, 3AH, 3BB, 3CQ, 3DH, (3EN), 3FG, (3GO), (3NB), 3QE, 3TA, 3UO, 3VT, (3VV), 3YV, (4AG), 4AL, 4AU, 4EL, (4EY), 4DA, 4BY, (4BQ), (4YB), 5DA, 5NL, 5PM, 5ACF, 5ARW, 5AZ, 5AGK, 5AKA, 5AGB, 5ARU, 5AEE, 5AY, 5AMP, 5ANJ, 5AB, 5AP, 5AA, 5AMP, 5AD, 5AMZ, 5ADE, 5AFD, 5BO, 5BV, 5BU, 5BP, 5CD, 5CG, 5CP, 5DR, 5DV, 5DE, 5DC, 5DP, 5EY, 5EV, 5FK, 5FI, 5FT, 5FN, 5GW, 5GI, 5GBT, 5HF, 5HL, 5HP, 5HA, 5HY, 5HG, 5IL, 5IS, 5IK, 5ID, 5JE, 5JJ, 5KJ, 5KP, 5LH, 5LQ, 5LU, 5MZ, 5NZ, 5NM, 5NF, 5QV, 5QH, 5QW, 5RQ, 5SP, 5TT, 5UO, 5VV, 5VK, 5WY, 5XU, 5XI, 5XM, 5XH, 5YK, 5YJ, 5ZB, 5ZE, 5YH, 5YJ, 5YK, 5YQ, 5YR, 5YU, 5UH, 5UU, 5UF, 5UH, 5US, 5XM, 5YE, 5YR, 5ZJ, 5ZB, 5ZL, 5ZY.

3CA, ROANOKE, VA., January 1BBL, 1GBC, 1HAA, 1RAY, 1RU C.W., 1WZ, 2AWL, C.W., 2CC, 2DA, 2EL, 2RU, 2XA, 3ABC, 3ABF, 3AC, 3AHK, (3BZ), 3CC, 3DH, 3EN, 3F, 3FG, 3FN, 3GO, 3HG, 3HJ, 3JU, 3KM, 3PB, 3PU, 3VV, 3XF, 3XL C.W., 3ZM, 4AG, 4AU, 4BK, 4BY, 4CG, 4DA, 4XC, 4YB, 5DA, 5DO, 5ER, 5JD, 5YE, 5AB, 5ACF, 5AGJ, 5AI, 5AKV, 5AOU, 5ARM, 5AY, 5CG, 5CH, 5DP, 5EC, 5EF, 5ID, 5IK, 5KP, 5KZ, 5ML, 5NL, 5NM, 5NQ, C.W., 5PI, 5RR, 5SP, 5TJ, 5TN, 5UK, 5VJ, 5WY, 5XE, 5YV, 5XA, 5ZB, 5ZC, 5ZQ, 5ZL, 5ZR, 5ZV, C.W., 5ZW, 5ZY, 5ABL, 5AEG, 5AO, 5BW, 5BY, 5EL, 5EQ, 5FG, 5FS, 5GX, 5JL, 5JN, 5L, 5LQ, 5MC, 5M, 5QJ, 5UH, 5VJ, 5WW, 5ZJ, 5ZL, 5ZN.

4CN, BUENA VISTA, GA., Dec. 24-31 3AD, 3AH, 3CC, 3HG, 3HJ, 3VV, NSF (fone concert QSA), 4AG, 4AL, 4AM, 4AN, 4AT, 4AU, 4BK, 4BQ, 4CG, 4DI, 4DZ C.W., 4RA, 4EK, 4XC, 4ZC, (Continued on Page 62.)

Order Your Radio Goods

THE Sensational success of the Continental Store in New York, has lead to the extension of Continental Service to all parts of the United States and Canada. Customers here in our store have marvelled at finding such complete assortments in one store; they have wondered at a radio store so up-to-date in new apparatus; they have been delighted with the courteous, interested attention they received.

Every advantage of our location,—in the heart of New York,—of our standing with all the leading radio manufacturers,—and of our ideals of service and the square deal, are now available for you, wherever you live. Remember

Our word of Honor to you is our Guarantee: *Let us prove it*

C W APPARATUS

We are making a specialty of everything used in C.W. transmission. If there is any item you need, not listed below, write us for further information and prices.

C.W. INDUCTANCES

No. 181 Tuska C.W. Inductances	\$7.50
No. 181 Tuska C.W. Inductances, unassembled	5.00
No. 182 Tuska C.W. Inductances	10.00
No. 182 Tuska C.W. Inductances, unassembled	7.00
No. 183 Tuska C.W. Inductances	12.50
No. 183 Tuska C.W. Inductances, unassembled	10.00

CHOKE COILS

Acme 1 1/2 Henry, 500 MA Single Coil	\$6.00
Acme 1 1/2 Henry, 500 MA Double Coil	8.00
Acme 1 1/2 Henry, 150 MA Single Coil	4.00
Acme 1 1/2 Henry, 150 MA Double Coil	4.00
C.E.Co. ZRX 8 Henry 150 MA Single Coil Choke	3.75

TELEPHONE TRANSMITTERS

Sterling Microphone	\$2.50
---------------------	--------

RESISTANCES (Ward Leonard)

Ward Leonard Resistance, 5000 ohm	\$1.70
Ward Leonard Resistance 10000 ohm	2.95
Ward Leonard Resistance 15000 ohm	1.50
Ward Leonard Resistance 12000 ohm	3.50
Lavite Resistance 48000 ohm for Radio frequency amplifiers	3.00

MODULATION TRANSFORMERS

Acme A-3 unmounted	\$7.00
Acme A-3 semi-mounted	5.00
Acme A-3 unmounted	4.50
C.E.Co. ZRM Modulation Transformer	4.50

GRID LEAKS

Marconi 1, 2, 3, or 5 megohms	\$1.25
Chelsea Variable 1/2 to 5 megohms, 10 values	8.00
Chelsea Oscillator	3.00

METERS (Weston Model 301)

Model 301 0-3 amperes flush	\$8.50
Model 301 0-5 amperes flush	8.50
Model 301 0-50 Volts flush	8.50
Model 301 0-100 Milli-amperes flush	8.50
Model 301 0-300 Milli-amperes flush	8.50
Model 301 0-500 Milli-amperes flush	8.50
Model 301 0-800 Milli-amperes flush	8.50



Licensed under Armstrong and Marconi patents

Wave length, 160 to 1000 meters.

Amplification 100 times.

24% greater selectivity than even the Paragon R.A. 6.

No dead end losses whatever.

Vernier attachments on all controls.

For Your Own Protection :—Genuine Paragons are made only by Adams-Morgan Co., and sold by Continental and affiliated dealers.

METERS (Hot Wire)

No. 127 Gen. Radio flush 0-1 Amp.	\$7.75
No. 127 Gen. Radio flush 0-3 Amp.	7.75
No. 127 Gen. Radio flush 0-10 Amp.	7.75
No. 127 Gen. Radio flush 0-5 Amp.	7.75

RHEOSTATS

214 Gen. Radio front or back mounted	\$2.50
Paragon Rheo. front or back mounted	1.75
Mesco Porcelain base	1.40

BUZZERS FOR BUZZER MODULATION

Century 168 Buzzer	\$2.50
Mesco No. 51 Buzzer	2.50
Mesco 251 Buzzer	.95

HIGH FREQUENCY CHOKE COILS

\$1.50

Electrodyne Rectifier consists of 500 V Transformer and 2 rectifying vacuum tubes all mounted ready for use.

No. 25 R T Rectifier less tubes

\$35.00

No. 25 V T Vacuum Tube

Each 7.00

TRANSMITTING TUBES

\$7.50

Gen. Radio Drum switch

6.50

JEWELL METERS (Model 33)

0-1 flush	\$4.50
0-3 flush	8.50
0-5 flush	8.50
0-50 Volts flush	6.50
0-500 Volts flush	15.00
0-50 Mil. Amp.	6.50
0-100 Mil. Amp.	6.50
0-300 Mil. Amp.	6.50
0-500 Mil. Amp.	6.50

JEWELL THERMO AMMETERS

0-1 Amp.	\$18.00
0-3 Amp.	18.00
0-5 Amp.	18.00
0-10 Amp.	18.00

CONTINENTAL RADIO AND ELECTRIC CORP.

by Mail— from Continental

PARAGON R. A. TEN

Amplifying Short Wave Receiver

THERE are plenty of receiving sets for less money than Paragons. However, the difference in performance is invariably far greater than the difference in price. A genuine Paragon R.A. Ten costs Eighty-Five dollars, but,—it's a Paragon,—there is no better. Check up these superiorities against any other receiving set:

Coupling has scale of 180°.

Free from all body capacity effects.

Guaranteed for two years.

"The weaker the signal the stronger the amplification."

Price, Eighty-five Dollars.

*If it isn't an R. A. Ten, it isn't a Paragon,
Look for the full name engraved on the Bakelite
Panel*

TRANSFORMERS (For C.W. Work)

Acme 200 Watt, mounted.....	\$20.00
Acme 200 Watt, unmounted.....	16.00
Acme 50 Watt, mounted.....	15.00
Acme 50 Watt, unmounted.....	12.00

MOTOR GENERATORS

International 500 V 100 Watt AC Drive.....	\$99.00
International 500 V 100 Watt DC Drive.....	110.00
Electric Specialty Co. 350 V 50 Watt AC or DC.	97.00

CONDENSERS

WE 21 AA 2 MFD tested at 100 Volts.....	Each \$2.65
Dubilier 25 MFD Mica Condenser tested at 1800 Volts.....	\$6.00
Dubilier .0005 Grid Condenser for transmitting sets.....	1.00
High Voltage Variable Air Condenser will stand 1000 V. Capacity .001 MFD. Just the condenser for your Antenna circuit.....	30.00

**Get Your Copy of Our New
112 Page Catalogue**

It contains undoubtedly the widest assortment of radio goods ever assembled together. The appendix includes tables for quickly figuring all radio calculations, as well as the conventional signals, abbreviations, etc. This valuable catalogue mailed anywhere in the world for 25 cents. Send for your copy today.

J. DI BLASI, Sec. (Dept. B22) 6 Warren St., N.Y.
J. STANTLEY, Treas.

AS FAR as we know, no customer here in our store has ever been disappointed with the treatment he received. You may be sure, we will do everything in our power to preserve this reputation in our dealings with you.

Order your radio supplies direct from this ad, and expect,—shipments the day your order is received,—exact compliance with the terms your order,—and apparatus that is packed to arrive in perfect condition.

You may send in your order in any form that is convenient for you. We prefer remittance by check or P.O. Money Order. Then, if the goods are not perfectly satisfactory on arrival, your money will be refunded in full, without question.

You take no risk whatever in ordering by mail,—from the Continental Store.

AMPLIFYING TRANSFORMERS

No. A-2 Acme, mounted.....	\$7.00
No. A-2 Acme, semi-mounted.....	6.00
No. A-2 Acme, unmounted.....	4.50
No. 226-W Federal.....	7.50

"B" BATTERIES

No. 7623 Standard 22.5 V small.....	\$1.50
No. 7625 Standard 22.5 V large.....	2.65
No. 7650 Standard 22.5 V variable.....	3.50
No. 766 Eveready 22.5 V. large.....	3.50
No. 765 Eveready 22.5 V. small.....	2.25
No. 703 Eveready flashlight cells, set of 10 45 V.	3.50

MARK AND MAIL THIS COUPON TODAY

Continental Radio and Electric Corp., Dept. B-22,
6 Warren Street, New York City.
Gentlemen:

Enclosed find remittance for \$85.00. Ship at once one of your wonderful, new PARAGON R. A. TEN receivers.

Send me, FREE your complete and interesting booklet, describing every phase of the PARAGON R. A. TEN'S superiority.

Enclosed find remittance for 25c. Send me your 112 page complete radio catalogue.

Name _____

Address _____

QRA., 5DA, 5DN, 5DY, 5EO, 5ER, 5FA, 5IC, 5IO, 5IS, 5XA, 5YE, 5YH, 5ZC, 5ZH, 8AC, 8AEY, 8CF, 8DZ, 8DE, 8DG, 8DP, 8DR, 8GI, 8GY, 8HG, 8HI, 8ID, 8IK, 8KP, 8LR, 8MD, 8ML, 8NI, 8SH, 8XK, 8ZE, 8ZL, 8ZP, 8ZY, 9ACB, 9AE, 9AEG, 9AEN, 9AM, 9AP, 9AEC, 9EL, 9FT, 9GH, 9GX, 9HA, 9IZ, 9JN, 9JQ, 9KO, 9LQ, 9LR, 9MA, 9MC, 9MY, 9OC, 9OE, 9OR, 9OX, 9QU, 9UK, 9UU, 9WE, 9WN, 9GC.

4FD, MIDVILLE, GA., Jan. 1-12

1AW, 1ER, 1OE, 2GR, 2VU, 3AB, 3BL, 3BQ, 3CC, 3EN, 3FS, 3GO, 3G, 3HJ, 3KM, 3OB, 3PU, 3VV, 3ABC, 3ACS, 3ABG, 4AL, 4AM, 4AN, 4BK, 4BQ, 4AU, 4CB, 4CG, 4EK, 4EY, 4XA, 4XC, 5BY, 5CG, 5CI, 5CL, 5DA, 5ER, 5EJ, 5HL, 5KL, 5LA, 5LC, 5LS, 5LP, 5LX, 5YE, 8CF, 8DC, 8EF, 8FJ, 8FM, 8FT, 8GB, 8GO, 8HG, 8ID, 8IK, 8JU, 8KH, 8KM, 8LE, 8LL, 8LP, 8NN, 8OE, 8OP, 8QJ, 8SP, 8TT, 8UK, 8VJ, 8WS, 8WY, 8XX fone, 8AAK, 8AAL, 8ACF, 8AFB, 8AIB, 8AIE, 8ALM, 9AC, 9AP, 9EL, 9ET, 9FU, 9GC, 9GX, 9HG, 9JT, 9KO, 9LB, 9LL, 9LX, 9MC, 9MJ, 9OE, 9QX, 9RL, 9UF, 9UH, 9UK, 9UU, 9VC, 9VS, 9WE, 9AAW, 9AAN, 9ABH, 9ABL, 9ABR, 9ACF, 9ACN, 9AEE, BCO, NSF fone

4BX, WILMINGTON, N. C., January

1BBL, 1HAA, 2DA, 2CO, 2EH, 2GR, 2PU, 2QR, 2RK, 2SS, 2TF, 2UC, 2ZA, 2ZL, 2ZM, 2ZC, 3AHK, 3AFK, 3DM, 3HR, 3DH, 3XF, 3XL, 3YE, 3YY, 3ZR, 3ZR, 4AN, 4AT, 4AO, 4AN, 4EP, 4DZ, 5YE, 5DA, 5AHK, 5ARK, 5ARW, 5AEY, 5BP, 8DJ, 5HA, 5IV, 8JS, 8LD, 8UY, 8XE, 8VS, C.W., 8XK, phone, 8YK, 8YR, 8YV, 8ZA, 8ZD, 8ZL, 8ZT, 8ZV, 8ZW, 9AAC, 9AL, 9FS, 9GS, 9LQ, 9LZ, 9QM, 9TWB, 9ZB, 9ZN, 9ZY, 9ZJ, 9YC.

5ZZ, BLACKWELL, OKLA., Dec. and Jan.
1IR, 1WC, NSF, 3EP, 3CK, 4BK, 4XE, 4CP, (5AI), (5AO), (5BI), ((5BO), (5BW), (5BX), (5CI), 5CK, (5CG), 5DA, (5EA), (5DW), 5ER, 5EJ, 5ES, 5EW, 5FA, (5FL), 5FN, 5HK, 5IO, 5JA, 5JE, 5JS, 5JD, (5IF), 5IP, 5LA, 5LR, 5LK, 5LL, 5LO, 5PM, (5WC), (5XB), (5YE), (5YI), (5YM), (5ZA), (5ZC), (5ZF), (5ZG), 5ZK, (5ZL), (5ZN), 5ZP, (5ZR), (5ZS), (5ZT), (5ZU), (5ZW), (5ZX), 6EO, 6EG, 6IG, 6GE, 6JI, 6ZM, 7CC, (7IM), 8AF, 8BP, 8CF, (8DI), 8FL, 8FT, 8JJ, 8LV, 8SP, 8ZC, 8ZJ, 8ZL, (8ZL), 8ZR, (8ZV), 8ZW, (8ZY), 8ZZ, 9AP, 9AR, 9AY, 9AK, 9AAC, 9ABL, 9ACN, 9ALP, 9AIG, 9AIC, 9ALX, 9ALI, 9ALG, 9AKC, 9ALK, 9AMB, 9AOX, 9AOJ, 9AQG, 9ARK, 9ASO, 9ATL, 9AUO, 9AUX, 9AWN, 9AXU, 9AWJ, 9AXA, 9AWG, 9AYI, 9CK, 9ET, (9FL), (9FM), 9EW, 9FN, 9FT, 9FS, (9JN), (9HN), (9HI), (9HL), 9HQ, 9GO, 9GC, 9GR, (9HT), 9HR, 9HK, 9JX, (9JA), 9JS, 9JB, 9JC, (9IF), 9KD, (9KV), 9LA, (9LC), 9LZ, 9LQ, 9LW, 9NC, 9MH, 9MC, 9NL, 9MC, 9PN, 9QG, 9OC, 9QM, 9QG, 9QQ, 9RY, 9RR, 9RV, 9SL, 9TW, 9SE, 9TH, 9SY, 9SZ, 9VK, 9UR, 9UU, 9VC, (9ZB), (9ZC), 9ZH, (9ZJ), (9ZL), (9N), (9ZQ), 9ZS, (9ZT), 9ZV, (9ZX), (9ZY), (9YA), (9YI), (9YM), 9YW.

5YB, JACKSON, TENN., Jan. 18 to 25
1OE, 2RK, 2SS, 3CS, 3EN, 3HJ, 3HX, 3VV, 3YH, 4AG, 4XC, 5AQ, 5BI, 5ER, 5HL, 5HN, 5XU, 5YE, 5ZC, 5ZL, 5ZX, 8AEY, 8AS, 8BK, 8BO, 8BP, 8EZ, 8FK, 8HG, 8HN, 8HT, 8ID, 8IH, 8IK, 8KK, 8LF, 8LU, 8LV, 8NZ, 8OJ, 8UI, 8UY, 8VJ, 8XE, 8XH, 8ZL, 9AA, 9AAC, 9ABX, 9AEG, 9AH, 9AIM, 9ASL, 9ATL, 9AVW, 9CA, 9CS, 9DU, 9EK, 9EL, 9EQ, 9HG, 9HI, 9HT, 9HY, 9JT, 9KL, 9KR, 9LR, 9MC, 9MS, 9NJ, 9NQ, 9OE, 9OX, 9OY, 9PS, 9PV, 9QO, 9UF, 9UH, 9UJ, 9UU, 9UW, 9VJ, 9WE, 9XM, 9YM, 9ZB, 9ZN, 9ZS, 9ZT, BCO, NSF.

5ZC, DALLAS, TEXAS, January.

1IR, 2XN, C.W., 2ZL C.W. on QSS test, 4BY, 4AG, (5AI), (5AL), (5AJ), (5BI), (5BJ), 5CE, (5CI), (5CG) calls fifteen times, 5CL, (5DW), 5DO sends QST ten times, 5ER, (5EJ), 5EB, (5FL), (5HL), (5HV), (5IS), 5IF, (5IF), 5JS, 5JH, (5JA), 5JD, 5JL, 5JE, 5KO, (5LC), 5LB, 5LL, 5LG, 5LK, 5YM, 5YE, (5YH), 5YU, 5XI, (5ZA) (5ZB), (5ZK), (5ZL), (5ZF), (5ZT), (5ZU), (5ZW), (5ZX), 6IG, 6ZH, SAN, 8AEY, 8BP, 8FK, 8GY, 8ID, 8IK, 8KT, 8SP, 8ZG, 8ZL, 9AA, 9AF, 9AE,

9AY, 9ABX, 9AAC, 9ARA, (9AGE), 9ARJ, (9AFX), (9AEQ), 9AHL, (9BW) spark and C.W., 9CA, 9CRR, (9EE), 9FY, 9FU, 9HT, 9II, (9HN), 9IC, 9ICN, 9JT, (9JN), 9JU, 9KW, 9KO, (9KV), (9LR), 9LL, 9LW, 9MO, 9MC, 9NQ, (9OE), 9ON, 9QU, 9RY, 9SU, 9VR, 9WI, 9XB, 9XI C.W., 9XM spk. & fone, 9YA, 9YY, 9YI, 9YTA, 9YO, 9ZB, 9ZL, (9ZN), 9ZJ, 9ZW, NSF.

6AE, STANFORD UNIVERSITY, CAL., Sept. 20 to

Jan. 24.

(5XD), 5ZA, (6AAK), 6ADL, 6BQ, (6CT), (6CU), 6DA, 6DH, (6EA), 6F, 6EC, (6EL), 6EN, (6ER), (6FE), 6FD, (6FT), 6GC, 6GE, 6GF, 6GH, 6HK, (6HY), 6IF, (6IG), (6IL), 6IU, 6JC, (6JD), (6JI), (6JM), (6JT), 6KA, 6KE, 6KP, 6KQ, 6KS, 6MY, 6MZ, 6OL, 6OT, (6PE), 6PQ, 6QM, (6QR), 6RE, (6SK), 6TX, 6UO, 6WI, 6WZ, 6XZ, 6ZA, 6ZB, (6ZH), 6ZL, (6ZM), 6ZN, 7AD, 7BH, (7BP), 7BR, (7CC), 7CE, 7CR, (7CU), (7CW), (7DA), 7DH, 7ED, 7EX, (7GQ), 7GY, 7HN, 7IM, 7IM, 7IU, 7KK, 7KO, (7YA), (7YS), 7ZA, (7ZB), 7ZH, (7ZI), 7ZJ, 7ZK.

6EC, ANAHEIM, CAL., January
5ZA, 6AK, 6AN, 6AT, 6AAK, 6AMP, 6ACY, 6ADX, 6AN, 6AFW, 6AFY, 6AGN, 6AGP, 6AHA, 6AHQ, 6AH, 6AIL, 6BJ, 6BQ, 6CU, 6CV, 6DA, 6DK, 6DP, 6DR, 6EA, 6EB, 6EJ, 6EK, 6EN spk. & C.W., 6ER, 6FI, 6GF, 6GI, 6HH, 6HY, 6IF, 6IG, 6IL, 6IR, 6IT, 6IU, 6JD, 6JJ, 6JR, 6KA, 6KM, 6LK, 6OH, 6PQ, 6SK, 6TL, 6XZ, 6ZH, 6ZR.

6ABA, ALTADENA, CAL., Jan. 1—Feb. 14.
6AC, 6AF, 6AK, 6AN, 6AT, 6CH, 6CO, 6DH, 6DK, 6DP, 6EJ, 6FN, 6FV, 6GN, 6GY, 6JN, 6JR, 6LN, 6NF, 6NY, 6OW, 6PD, 6TC, 6TL, 6ACM, 7IN.

6TG, OJAI, CALIF., Oct. 15—Jan. 29
6ADL, 6ADU, 6AHQ, 6BF, 6BU, 6CU, 6EU, 6EN, 6ER, 6HH, 6IF, 6IG, 6IQ, 6JD, 6JM, 6JR, 6JY, 6KA, 6KI, 6KM, 6KP, 6MZ, 6NY, 6OH, 6OL, 6OS, 6PL, 6PQ, 6QB, 6QR, 6SD, 6TL, (6VZ), 6WI, 6WN, 6XZ, 6ZE, 6ZR.

AIR MAIL RADIO STATION, ROCK SPRINGS, WYO., January.

1AW, 2RK, 3DH, 4AN, 5BI, 5IF, 5XD, 5ZA, 5ZC, 5ZH, 5ZJ, 5ZU, 6AAE, 6AE, 6AFU, 6ACD, 6ADL, 6AH, 6AK, 6AT, 6BAC, 6BJ, 6BP, 6BQ, 6CO, 6CV, 6DP, 6EA, 6EB, 6EJ, 6EV, 6FD, 6FI, 6GE, 6GI, 6JG, 6JI, 6JJ, 6JR, 6JT, 6KA, 6KM, 6LK, 6LN, 6MK, 6OI, 6PO, 6PR, 6QR, 6RE, 6SJ, 6TA, 6VS, 6ZA, 6ZH, 6ZM, 6ZN, 6ZO, 6ZR, 7CC, 7DA, 7EX, 7IN, 7JX, 7KB, 7KT, 7LN, 7TK, 7XD, 7YA, 7ZG, 7ZJ, 7ZK, 8HG, 8ZW, 8ZL, 9AC, 9AAW, 9ABX, 9AC, 9AEQ, 9AEY, 9AGN, 9AIF, 9AIG, 9AMB, 9AWG, 9AWS, 9BR, 9BW, 9EQ, 9EZ, 9HI, 9HM, 9HN, 9HQ, 9HT, 9IA, 9IG, 9JM, 9JN, 9JU, 9KV, 9LC, 9LP, 9LR, 9LW, 9MQ, 9MS, 9NQ, 9OE, 9ON, 9RV, 9SW, 9UQ, 9UT, 9WU, 9WG, 9XI, 9XI, 9XM, 9YA, 9YI, 9YM, 9YT, 9YW, 9YY, 9ZB, 9ZC, 9ZJ, 9ZN, 9ZQ, NSF.

7ZJ Ex-7CU, VANCOUVER, WASH., January.
(5ZA), 6AA, 6AA, 6AAW, (6ACD), (6AE), 6AFN, (6AFU), 6AFY, 6AGF, (6AH), (6AK), 6AN, 6AR, (6AS), (6AT), 6BAC, (6BB), 6CH, 6CO, 6CV, 6DK, 6DN, (6DP), (6DY), (6EA), 6EB, (6EJ), 6EK, 6EN, (6ER), (6EX), (6FH), (6FI), 6FN, (6GF), 6GI, 6GK, (6GR), 6GY, 6HH, (6HP), (6IC), 6IF, 6II, 6IQ, 6IT, 6IY, (6JD), (6JN), (6JR), (6JT), (6KA), 6KM, 6KZ, 6NH, 6NO, (6OC), (6OH), 6OT, (6PM), 6PO, 6PQ, (6PR), (6QR), 6RE, (6TC), 6UM, 6VS, 6VX, (6ZA), (6ZE), (6ZH), 6ZK, 6ZM, (6ZN), (6ZO), 6ZQ, (6ZR), 6ZU, (7AD), 7AY, 7BC, 7BF, 7BH, (7BQ), (7BV), (7CA), (7CC), (7CE), (7CW), 7DM, 7DR, (7EX), (7GQ), (7HE), 7HS, (7IM), (7IN), (7IU), 7JR, (7JX), (7LN), (7YA), 7ZG, 7ZH, 9EE, 9EQ, 9LR, 9OE, 9ZN, 9ZQ.

7DA, PORTLAND, ORE., Dec. 27 to Jan. 20
(5ZA), (6AE), (6AH), (6AK), 6AN, 6AR, (6AS), 6AT, (6BB), (6BJ), 6CH, 6CO, (6CP), (6CV), 6CZ, 6DJ, (6DK), 6DP, (6DY), (6EA), (6EB), (6EJ), 6EN, (6ER), (6EX), (6FE), 6FH, (6FI), 6GI, (6GK), 6GO, 6GR, 6HF, (6HP), 6HY, 6IL, (6IU), (6JD), (6JN), 6JP, 6JR, 6JT, (6KA),

(6KL), (6KM), (6KP), 6KQ, 6KZ, 6NG, (6NH), 6NO, (6OC), (6OH), 6OT, (6PO), (6PR), (6QR), (6TC), 6UM, 6UO, 6XZ, (6ZA), 6ZE, 6ZH, (6ZK), (6ZM), (6ZN), (6ZO), (6AAT), (6AAW), 6ACD, (6AEA), (6AFN), 6AGB, 6AGF, 6AIK, (7AD), 7AE, (7BC), (7BQ), (7BV), (7CC), (7CE), 7CN, (7CW), (7EX), 7FB, 7FL, (7GQ), 7HF, 7IM, (7IN), (7IU), 7JJ, 7JR, (7JX), (7LN), 7XD, (7YA), 7ZG.

GEO. W. DAVIS, COUDERSPORT, PA., Jan. 1AE, 1AW, 1BAB, 1BBL, 1BY, 1CBX, 1CH, 1CV, 1CY, 1EP, 1FV, 1GBC, 1GBT, 1HA, 1HAA, 1JQ, 1OE, 1PU, 1QL, 1RAY, 1RQ, 1XT, 1XX, 2AA, 2APB, 2AR, 2ARW, 2BZ, 2CC, 2CE, 2CM, 2DA, 2DN, 2DR, 2EL, 2JJ, 2JU, 2LD, 2OA, 2OO, 2OR, 2PB, 2QD, 2QM, 2RB, 2RK, 2ZA, 2ZD, 2ZL, 3AA, 3ABC, 3ABG, 3ABK, 3ACM, 3AHK, 3AIC, 3BH, 3BG, 3BM, 3BO, 3BZ, 3CC, 3CG, 3CM, 3CQ, 3DF, 3DH, 3EN, 3FB, 3FG, 3FK, 3FR, 3GH, 3GO, 3GZ, 3HG, 3HJ, 3HV, 3HX, 3IW, 3KK, 3KM, 3KN, 3LS, 3ND, 3OU, 3PB, 3PS, 3PU, 3QW, 3TJ, 3VC, 3VV, 3XF, 3XL, 3YB, 4AI, 4AO, 4BY, 5DA, 5ER, 5ZA, 8AAG, 8AAZ, 8ACF, 8AGS, 8AEE, 8AEL, 8AFD, 8AGB, 8AGD, 8AGO, 8AI, 8AJW, 8AKJ, 8AMQ, 8AMU, 8AMX, 8ANB, 8AND, 8ANK, 8ARK, 8ARO, 8ARW, 8BO, 8CE, 8DC, 8DE, 8DH, 8DJ, 8DP, 8DQ, 8DR, 8DV, 8EA, 8EF, 8FG, 8FI, 8FK, 8FN, 8FQ, 8FT, 8FW, 8GA, 8GE, 8GI, 8GL, 8GT, 8GW, 8HA, 8HF, 8HG, 8HJ, 8HP, 8HQ, 8HY, 8ID, 8IE, 8IIZ, 8QRA, 8IK, 8JE, 8JJ, 8JQ, 8JU, 8KP, 8KQ, 8LR, 8LH, 8LF, 8LM, 8MT, 8MZ, 8NZ, 8OI, 8OQ, 8PN, 8PQ, 8PU, 8QC, 8QJ, 8QM, 8RI, 8RQ, 8SH, 8SP, 8TK, 8TN, 8TT, 8UP, 8VQ, 8WY, 8XE, 8XK, 8XQ, 8XU, 8ZA, 8ZB, 8ZE, 8ZI, 8ZL, 8ZR, 8ZV, 8ZW, 8ZY, 9ABL, 9GX, 9HR, 9KV, 9LQ, 9LX, 9MC, 9UH, 9YB, 9ZB, 9ZJ, 9ZL, 9ZN, NSF.

SWA, DETROIT, MICH., January. 1RA, 2BK, 2DN, 2JJ, 2KB, 2RK, 3AA, 3ASK, 3BP, 3CC, 3DE, 3DH, 3EN, 3HJ, 3HK, 3HX, 3KE, 3KM, 3LM, 3NC, 3VV, 4H, 5LO, 8AB, 8ACF, 8AD, 8AGO, 8AI, 8DG, 8FT, 8GI, 8HP, 8IL, 8JE, 8KH, 8KV, 8LV, 8NI, 8NZ, 8QJ, 8RI, 8SP, 8UY, 8VQ, 8WY, 8XE, 8XH, 8XU, 8ZD, 8ZI, 8ZL, 9AAC, 9AC, 9AE, 9AGN, 9AOX, 9AWG, 9AWX, 9CL, 9EL, 9EQ, 9GU, 9GX, 9HM, 9HN, 9JN, 9KC, 9KN, 9KO, 9LC, 9LQ, 9OX, 9PN, 9TO, 9UH, 9UK, 9UU, 9WW, 9ZB, 9ZC, 9ZN, 9YM, NSF.

ALL C.W., 8ZG, SALEM, O., January. 1AE, 1CF, 1XX, (2CS), (2ZL), (3AAE), 3XL, (4XB), (8NQ), (8VS), (8AGZ), (8JIM), (8ZW), (8JU), (8ZV), 8OZ, 8PW, 8YG, 8ZR, 8ZX, 9XL, 9YM, 9XZ, (9XM), XB1, (XF1), (XK1), (FAS).

SWE, ELMIRA, N. Y., January. 1AE, 1AW, 1BAB, 1BBL, 1CF, 1CK, 1CM, 1CZ, 1CBX, 1DY, 1GBT, 1HAA, 1HO, 1JR, 1MAD, 1NAQ, 1OE, 1RAY, 1RZ, 1XT, 1XX, 2AM, 2AR, 2AID, 2AWL, 2AXB, 2AXL, 2BA, 2BB, 2BM, 2CC, 2DA, 2DH, 2DI, 2EL, 2FG, 2JU, 2KM, 2OO, 2UC, 2XQ, 2XX, 2ZL, 3AC, 3BG, 3BL, 3BZ, 3DD, 3DH, 3DS, 3EN, 3FB, 3FG, 3HG, 3HK, 3KM, 3PU, 3UC, 3VV, 3XF, 3YH, 3ZE, 4AG, 4AL, 4BK, 4BY, 4XB, 5DA, 5AB, 5AJ, 5AM, 5AAG, 5ACF, 5AFE, 5AMQ, 5ANJ, 5ANK, 5AOE, 5APB, 5BP, 5CG, 5DE, 5DJ, 5DV, 5EC, 5EI, 5FG, 5FN, 5GI, 5GW, 5HG, 5ID, 5IK, 5KM, 5KP, 5KZ, 5LH, 5ML, 5NI, 5NZ, 5PQ, 5PW, 5RQ, 5SH, 5SP, 5TT, 5VJ, 5WY, 5XE, 5XK, 5XU, 5YV, 5ZA, 5ZE, 5ZR, 5VZ, 5ZW, 5ZY, 9ABL, 9FS, 9FU, 9JA, 9JN, 9LQ, 9LX, 9MC, 9ZJ, 9ZL, 9ZQ.

8ZR, MANSFIELD, OHIO, Nov. 1—Feb. 1. 1AW, 1GBT, 1HAA, 1IRY, 1XB, 2AHK, 2BK, 2CD, 2DA, 2DN, (2GA), (2GR), 2JU, 2JS, 2KN, 2LL, 2RK, 2TE, 2XV, (2ZM), (3AHK), (3ABC), 3BH, 3BL, 3BP, 3CC, (3DH), 3DJ, (3EN), 3HJ, 3HX, 3IF, (3NB), 3PN, 3QW, 3VV, 3XF, 3YH, 3YV, 4AD, 4AG, 4AN, 4BK, 4CG, 4XBCW, 4XD, 5AZA, 5AJD, 5DA, 5DO, 5EA, 5ER, 5HC, 5JE, 5XA, 5XB, 5XE, (5YE), (5YH), 5ZC, 5ZP, 5ZS, 8PN, (8DF), 8RI, (8SP), (8VS C.W.), 8VQ, 8WP, 8CW, (8XI), (8XK), 8YH, 8XR, (8ZA), (8ZD), 8ZM, (8ZP), (8ZV), 8ZX, (8AL), 8AY, 8ACF, 8AEE,

(8AGB), 8AGK, 8AJL, 8AKV, 8ANK, (8BO), (8BP), 8DF, 8DR, (8FK), 8FN, 8FS, 8FT, 8GI, (8GJ), 8GM, 8GW, (8GX), (8HG), (8HI), 8IJ, 8KP, 8KZ, 8LM, 8LV, 8NM, 9AD, 9AAC, 9ABL, (9AEQ), 9AHS, 9ADN, 9ATL, 9AWG, 9BP, 9BY, 9BW C.W., 9BY, 9CA, (9EQ), 9FN, 9FV, (9GS), 9HI, (9HM), 9HR, (9JL), 9JQ, 9JN, 9KK, 9KM, 9LG, (9LQ), (9LR), 9MC, 9NH, 9OX, 9QJ, 9QO, 9SQ C.W., (9VV), 9VH, 9VA, 9VW, 9WE, 9XI C.W., (9XW), 9YA, 9YI, 9YM, (9ZL), (9ZJ), 9ZQ.

9LQ, INDIANAPOLIS, IND., Jan. 8 to Feb. 8th. (1AW), 1HAA, (1IR), 2IM, 2JU, (2RK), 2RL, 2SZ, 3AR, (4CD), 4EK, 5AM, 5BB, 5BI, 5BM, 5BR, (5DA), 5DO, (5ED), 5FD, 8AY, (8BP), 8CU, 8DE, 8DJ, 8FI, 8FK, 8GE, 8GI, 8GW, (8HA), 8HG, 8HW, (8ID), (8IK), 8JE, 8JJ, 8JT, 8JU, (8KI), (8LQ), 8LW, 8LV, 8ML, 8NM, 8NZ, 8ON, 8OI, 8OT, (8QJ), 8SP, 8TT, 8WY, 8UT, 8VJ, (8AGK), (8AJ), 8AY, 8BB, 9BL, 9CP, 9DV, (9EC), (9EQ), (9FN), 9FQ, (9FS), 9GB, (9GN), 9GP, 9GW, (9GS), 9HM, (9HN), 9HP, 9HR, 9HW, 9JL, (9JN), (9QJ), 9JT, 9JV, 9KL, 9KM, 9KO, (9KR), (9KV), (9LC), 9LF, (9LQ), 9LW, (9MC), (9OE), 9OR, 9OS, 9OX, 9TL, (9PD), (9PS), 9RL, 9RY, 9UC, (9UK), 9US, 9VC, 9VS, 9WA, 9WU, (9AAC), (9ABH), (9ABL), (9ABX), 9ABZ, 9ACB, 9ACL, 9ACW, (9AEG), 9AEQ, (9AFO), 9AHD, 9AHI, 9AKC, 9AKH, 9ALI, 9AON, 9ARG, 9ARW, 9ASL, (9AVO), 9AYE, 9IFU.

9CA, MINONK, ILLS., Jan., Every District. 1AW, 1CK, 1DY, 1HAA, (2BK), 2CS, 2DN, 2DR, 2GR, (2JZ), 2PL, 2RB, (2RK), 2SZ, 2TF, 2TS, 2UC, 2UE, 2AHK, 2ZD, 3BZ, (3DH), 3EN, 3GO, (3HG), (3HJ), (3HX), (3W), 3LP, 3PU, (3VV), 3WL, 4AGG, (4BY), (4CG), (4XC), (5AL), 5BI, (5CA), 5EJ, 5EW, 5FL, 5JE, 4JG, 5JW, (5JS), (5KA), 5XB, (5YH), (5ZA), 5XC, 5ZG, 5ZL, (5ZP), 5ZU, 5ZV, 6EB, 6ER, 6JD, 6JT, 6KA, 6KP, 6ZA, 6ZK, 7DA, 8AB, 8AG, 8AL, (8BO), 8DV, (8K), (8FT), 8FU, (8GX), 8HG, (8ID), (8IK), 8JJ, 8KM, (8LU), 8LV, 8MF, (8MH), 8ML, 8MT, (8NZ), 8PJ, (8PM), 8RE, 8RG, (8RQ), 8TT, 8UJ, 8VJ, 8VQ, 8WO, 8WV, (8ADE), (8AGO), 8AIO, 8AJW, 8AKV, (8ANH), 8ANK, 8ANT, 8ATN, (8AK), 8XK, C.W., 8ZB, 8ZD, (8ZL), 8ZR, 8ZT, C.W., (8YM C.W.), 9XM C.W., 9DQ C.W., 8ZW, 8ZY, 9XI C.W., VY QSA, 9ZT C.W., 9CD

9ZN, CHICAGO, Dec. 1—Jan. 27, Every District. 1AR, (1AW), 1BAB, 1BBL, 1CK, 1DY, 1EA, 1ED, 1ING, (1HAA), (1JAP), (1RAY), 2AR, 2BK, (2DN), 2GR, 2HN, 2IF, 2MH, 2JU, (2JZ), (2RK), 2SZ, (2TF), 2UC, (2XQ), (2XW), (2ZM), 2ACM, 3AA, (3BP), 3CL, (3DH), (3EN), (3GO), (3HJ), 3KM, (3VV), 3WV, 3XF, 3ZE, (3AHK), (4AG), 4AP, 4BY, (4XB C.W.), (4XC), 4YB, 5BI, 5ED, 3EJ, 4EL, 5ER, 5FD, 5FV, 5HL, (5XA), (5XB), (5YE), (5YH), (5ZA), 5ZG, 5ZP, (5ZL), (5ZU), (5ZZ), 6JD, 6JT, (6ZH), 7CC, 8AB, (8AY), 8BO, 8BP, 8BU, (8DC), 8DG, 8DJ, 8DV, (8FI), 8GI, (8GW), (8GX), (8HA), (8HG), 8HI, 8HJ, (8IB), (8ID), (8IN), (8IV), 8JF, (8JJ), 8KP, 8LB, (8LQ), (8LU), (8LV), 8MA, 8MF, (8MH), (8ML), 8MZ, 8NZ, 8OI, (8QJ), 8PM, 8PN, 8QJ, (8RQ), (8SP), 8TK, 8TN, (8VJ), 8XE, 8XH, (8XK), (8ZE), (8ZG), (8ZG C.W.), (8ZL), (8ZR), 8ZN, 8ZT, 8ZV, 8ZW C.W., (8ZW), (8ZW C.W.), (8ZY), (8ZZ), (8ADE), 8AAZ, 8AEE, 8AGO, 8AJW, (8AKV), 8ANK, 8ANO, 8ARK, 8CAS, 9AK, (9AP), (9BW), (9CA), (9CS), (9DP), 9DU, 9DV, (9EE), 9EK, (9EQ), 9EL, (9ET), 9FG, 9FN, 9FS, 9GC, (9GN), (9GP), 9HI, (9HM), (9HN), (9HT), (9HY), 9IF, (9JA), (9JN), (9QJ), (9JT), (9KL), (9KO), (9KV), 9LA, 9LF, (9LQ), (9LR), 9LW, 9MC, (9MH), 9NK, (9NQ), 9NS, (9OE), (9OS), (9OX), 9PC, 9PI, 9PJ, (9PL), 9QH, 9QO, 9RY, (9UH), 9UK, 9VL, 9VS, 9VZ, (9WE), (9WT), (9WU), 9XI, 9XI C.W., (9XM), 9XM C.W., 9XO, 9YA, 9YB, 9YI, 9YM, (9LW), (9YY), (9ZB), (9ZC), (9ZJ), (9ZL), (9ZQ), (9AAC), 9ABL, 9ABV, 9ACB, (9AEG), (9AEQ), (9AEY), 9AFV, (9AFX), (9AJD), (9AIG), (9AKC), 9AMN, 9ASF, 9ATL, (9AWK), 9AWZ, (NSF), (NAH C.W.), (WL2), (WWV), (XB1), (XF1).

(Continued on page 64.)

9AHC ELLENDALE, N. D., January.
 1IRJ QRA 7, 2RK, Canadian 4BG, 5BI, 5BM, 5BR, 5CG, 5CI, 5DW, 5EF, 5EJ, 5ES, 5ER, 5EW, 5HL, 5HV, 5IF, 5IS, 5JA, 5JD, 5JS, 5JT, 5LC, 5LR, 5XA, 5XB, 5XD, 5YE, 5YH, 5ZA, 5ZC, 5ZF, 5ZS, 5ZT, 5ZL, 5ZX, 5ZZ, 6IG, 6JD, 6JT, 6PE, 6RE, 6ZA, 6ZG, 6ZH, 6ZM, 7BQ, 7CC, 7DH, 7EX, 7HS, 7IM, 7LU, 7YA, 7ZG, 8AB, 8BP, 8CF, 8CP, 8DC, 8DG, 9DP, 9DR, 8FA, 8FG, 8FI, 8FK, 8FT, 8GW, 8HG, 8ID, 8IK, 8IL, 8IV, 8IZ, 8JJ, 8KM, 8KP, 8LQ, 8LU, 8MZ, 8NZ, 8QZ, 8SQ, 8TK, 8VJ, 8XH, 8XX, 8XS, 8ZC, 8ZL, 8ZP, 8ZR, 8ZW, 8ZY, 8AAZ, 8ACF, 8ADE, 8AEE, 8AEY, 8AFB, 8AGB, 8AIB, 8AKV, 8ANP, 8AAC, 9AAO, 9AAR, 9AAV, 9AAW, 9ABB, 9ABH, 9ABL, 9ABX, 9ACB, 9ACD, 9ACL, 9ACN, 9AEG, 9AEJ, 9AEQ, 9AEY, 9AFQ, 9AFQ, 9AFX, 9AGN, 9AGY, 9AGR, 9AHO, 9AHS, 9AHZ, 9AID, 9AIF, 9AIG, 9AIK, 9AIZ, 9AJN, 9AJS, 9AK, 9AKC, 9AKM, 9AKX, 9ALG, 9ALK, 9ALO, 9AMB, 9AMX, 9ANF, 9ANQ, 9AO, 9AOU, 9AP, 9AQI, 9ARC, 9ARZ, 9ASF, 9ASL, 9ASM, 9ATH, 9AUO, 9AUS, 9AVC, 9AVK, 9AWG, 9AWK, 9AWV, 9AWX, 9AWZ, 9AXJ, 9AXO, 9AXR, 9AXU, 9AY, 9AYE, 9AZ, 9BP, 9BR, 9BW, 9CA, 9CC, 9CP, 9CS, 9DD, 9DE, 9DF, 9DH, 9DN, 9DO, 9EL, 9EQ, 9ET, 9EW, 9FA, 9FC, 9FG, 9FL, 9FN, 9FQ, 9FS, 9FT, 9GC, 9GK, 9GN, 9GP, 9GS, 9GX, 9HI, 9HM, 9HN, 9HT, 9HY, 9IF, 9II, 9IY, 9JB, 9JK, 9JL, 9JN, 9JQ, 9JT, 9JY, 9KB, 9KG, 9KI, 9KK, 9KL, 9KN, 9KO, 9KR, 9KV, 9LC, 9LF, 9LG, 9LM, 9LN, 9LQ, 9LR, 9LW, 9LZ, 9MC, 9MH, 9MS, 9NC, 9NQ, 9NR, 9OB, 9OE, 9OO, 9OP, 9OR, 9OX, 9OY, 9PI, 9PN, 9PS, 9PV, 9QM, 9QO, 9RG, 9RV, 9RY, 9RZ, 9SC, 9SL, 9SQ, 9SV, 9SY, 9TF, 9TI, 9TO, 9TW, 9UG, 9UH, 9UK, 9UQ, 9UT, 9UU, 9VB, 9VC, 9VE, 9VJ, 9VR, 9VS, 9WE, 9WI, 9WJ, 9WR, 9WW, 9WZ, 9XI, 9XM, 9XT, 9YA, 9YC, 9YI, 9YM, 9YO, 9YV, 9YY, 9ZB, 9ZC, 9ZQ, 9ZH, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZU, 9ZY, 9SF.

SAGN, GRAND FORKS, N. DAK. Nov.—Jan.
 2RK, 2SZ, 2XX C.W., 2ZL C.W., 4AL, 5BA, 5BL, 5CG, 5DO, 5DW, 5ED, 5ER, 5HL, 5HM, 5VE, 5YH, 5ZA, 5ZC, 5ZG, 5ZL, 5ZS, 5YM, 5HR, 5JS, 5XB, 5ZF, 5ZZ, 5ZW, 5YF, 6IG, 6KA, 6ZA, 7CC, 7DH, 7IM, 7MS, (7EX), (7ZG), 8AB, 8AY, 8BP, 8AF, 8DZ, 8EC, 8ED, 8EZ, 8FI, 8FK, 8FT, 8HA, 8HM, 8IK, 8JL, 8JU, 8KF, 8LQ, 8MF, 8MZ, 8NI C.W., 8NQ, 8NZ, 8OJ, 8QJ, 8QQ, 8RK, 8UO, 8VJ, 8VS, 8WP C.W., 8ZK, 8ZC, 8XK C.W., 8XE, 8ZW. Too many nines. Canadian, (4AR).

9UH, NEWPORT, KY., January.
 (1AE) 1AR C.W., 1AW, 1CK, 1CZ, 1GBT, 1HAA
 1JAP, 1BBL, 1RZ, (2AR), (2AEF), (2AER),
 (2BK), (2DA), (2DN), (2DR), (2EL), (2JJ),
 (2JZ), (2OA), (2RB), (2RK), (2TF), (3AAE),
 (3AHK), (3BH), (3BC), 3CC, (3EN), (3GO), 3HG,
 (3HJ), 3HX, 3KM, (3PU), (3PS), (3UC),
 (3VV), (3NB), (3XF), 3YV, (3ZE), 3ZC, (4AG),
 (4AI), (4AU), (4CD), 4BK, (4BD), 4EK, (4XC),
 4YA, 4YB, 5BI, (5DA), (5ER), (5FV), 5HL,
 5JA, 5JD, 5JF, (5XA), 5XD, 5YE, (5YH), 5ZC,
 5ZP, 5ZX, 5ZZ, (5AL), (5BC), (5BO), (5BP),
 (5DG), (5DR), (5DE), (5DV), 5FI, (5FK), 5GI,
 (5GW), 5HA, (5ID), 5IK, (5JF), (5JU), (5JJ),
 5JE, (5KK), (5KM), (5KE), (5LB), (5LF),
 (5LH), 5LU, (5LK), (5LV), 5ML, (5MP), 5MZ,
 (5NI), (5NZ), (5OI), (5OJ), (5OM), (5PN),
 (5QJ), (5RQ), (5SP), (5UY), (5VJ), (5VQ),
 5AAZ, (5AGK), (5AGO), (5AJW), (5ANK), (5XE),
 (5XH), 5XX, 5XS, (5AT), (5AW), 5BW, (5CA),
 (5CP), 5EQ, 5EL, (5FS), 5GN, 5GP, 5HI, (5HN),
 5HT, 5JN, 5JL, 5JT, (5KL), 5KO, 5KV, 5LF,
 5LQ, (5LM), 5LR, (5MH), (5MS), 5OE, (5OX),
 5PV, (5UK), (5UU), (5VC), (5VV), 5WE,
 5AAC, 5AAL, 5AAV, 5AAW, (5ABL), (5ACJ),
 5AEG, 5AEQ, (5AFO), 5AFX, 5ARG, 5AWX,
 5XM, 5XW, 5ZB, 5ZJ, (5ZN), 5ZL, 5ZQ, (5SF),
 (5WL), 5XF, 5ZF.

CANADIAN 3DS, KITCHENER, ONTARIO,
 Nov. 14 to Jan. 15.
 Canadian: 3AA, 3AB C.W., 3BP fone & C.W., 3CF,
 3CY, 3DE, 3FO, 3FQ, 3KF (?).
 Yankee: 1AW, 1BM, 1MO, 1OE, 1RU C.W.,
 1XD C.W. fone, 1XX fone, 1BAB, 1BBL, 1GBT.

1HAA, 1NAQ, 2AR, 2BB, 2BG, 2BK, 2CY, 2DA,
 2JU, 2JZ, 2QR C.W., 2RK, 2SZ, 2TF, 2VA, 2WB,
 2XJ fone, 2XX C.W., 2ZL C.W., 2ZM, 3BG, 3BH,
 3BM, 3BZ, 3CC, 3EN, 3FB, 3GO, 3HJ, 3IW, 3KM,
 3QW, 3UC, 3XF, 3ZW, 3ABD, 3ACS, 3AHK, 3NF,
 3WV, 4DA, 4XB C.W., 4YB, 5BI, 5JD, 5ZA, 5ZZ,
 8AA, 8AB, 8AP, 8CE, 8DI, 8DR, 8DV, 8DW, 8ED,
 8EW, 8FI, 8FK, 8FM, 8FO, 8GB, 8GO, 8HA, 8HF,
 8HJ, 8IB, 8JF, 8JS, 8JU, 8KC, 8KP, 8LB,
 8LF, 8LN, 8ML, 8MM, 8MZ, 8NI apk, & C.W.,
 8NQ C.W., 8NZ, 8OY C.W., 8OZ, 8PQ, 8QJ, 8QM,
 8QZ, 8RW, 8SH, 8SP, 8TT, 8VF, 8VG, 8WP, 8WV,
 8WY, 8XB, 8XE, 8XH, 8XI, 8XX fone and C.W.,
 8XM, 8XU, 8YE, 8ZD, 8ZG apk, & C.W., 8ZL, 8ZR,
 8ZV apk, & C.W., 8ZW, 8ZX, 8ZY, 8ZZ, 8ACF,
 8AFB, 8AGZ 8AKA, 8AKV, 8AMB, 8AMJ, 8AMZ,
 9AP, 9BQ, 9BW, 9EE, 9EQ, 9FN, 9HN, 9JQ, 9JN,
 9KZ, 9LQ, 9MH, 9MS, 9RN, 9UH, 9UU, 9UX, 9YA,
 9ZG, 9ZL, 9ZN, 9ZQ.

THE LOG OF AN AMATEUR AT SEA

(Concluded from page 28.)

9:00 p.m. 5ZA very QSA
 12 5ZA very QSA calling CQ
 10:00 No use copying all the local 6 stations;
 knocking off.

Dec. 30, 60 miles south Los Angeles.

9:00 p.m. Air full of 6's; can't get any DX thru
 them except 5ZA, who is very QSA
 1:00 a.m. Knocking off—too much 6 stuff!

Jan. 4, 60 miles north Los Angeles. Pacific time.

7:46 p.m. 7AD talking to 7CW

58 5ZA very QSA
 No 6's copied because too close.

Jan. 17, 75 miles up Columbia River, Oregon.
 Pacific time.

Only very long distance stations logged here.

8:34 p.m. 5ZA calling 6CO QRK
 9:07 7CC calling 8KK very QSA
 7KK very QSA also
 7ZG QSA several times during evening
 6JD QRK all evening
 25 6VS signing off QRZ but readable.

THE RADIO LADIES

(Concluded from page 30.)

sister is liable to make in radio engineering and operation. We are minded of our experience at the Bureau of Standards in Washington recently. After finishing a Fading Conference, we attended one of the afternoon lectures given before the staff. We were struck by the number of ladies present, and as the subjects to be covered at the lecture were the magnetic exploration of steel bars for the determination of invisible defects and the measurements of the whip of great gun barrels, we wondered why the ladies. We asked if the learned gentlemen members of the staff dictated notes during lectures. The answer was, "No". Then we tackled from another slant. Were the ladies the secretaries of some of the distinguished scientists who made up the staff? Again, "No". Well, who were the ladies, anyway? Then we found that they were physicists, electrical engineers, chemical engineers, metallurgists, etc.

Draw your own conclusions, brothers, and watch out for sister, for she is coming. Let's welcome her. It will be lots more fun with her along.

D. L. INDUCTANCE COILS 1-2 Price

Order now, best coils given out first. All are good, some slightly shop worn. They are unmounted, and cover the wave lengths as follows:

Wavelength	Half Price
D-L 25, 130-375	\$0.83
D-L 35, 180-515	.85
D-L 50, 240-730	.88
D-L 75, 330-1030	.93
D-L 100, 450-1460	.98
D-L 150, 660-2200	1.05
D-L 200, 930-2850	1.10
D-L 250, 1300-4000	1.15
D-L 300, 1550-4800	1.23
D-L 400, 2050-6300	1.30
D-L 500, 3000-8500	1.38
D-L 600, 4000-12000	1.53
D-L 750, 5000-15000	1.65
D-L 1000, 6200-19000	1.88
D-L 1250, 7000-21000	1.93
D-L 1500, 8200-25000	2.05

AMERICAN ELECTRO TECHNICAL APPLIANCE COMPANY
Dept. B7, 235 Fulton Street New York City



Skinderviken Transmitter Button

J. Skinderviken
TRADE MARK

Patented in U.S.A. and Foreign Countries.

Pressure and Sound Waves reproduced electrically forms the basis for the most interesting study in speech and sound transmission. Scientists and experimenters recognise the Skinderviken Transmitter Button as the peer of adaptability and sensibility, consuming a minimum current. Maximum carrying capacity, 1½ ampere each Button, several can be placed in multiple when high amperage is desired. Among its thousands of adaptions are: Deaf-a-phones, Mechanical and Medical Stethoscopes, Detectiphones, Burglar Alarms, Loud Talking Devices, Wireless Telephone Transmitters, Howler Sets, Transmission of Music, Wireless Amplifiers, etc.

Sent Pos'paid insured \$1.00 with free illustrated circular and price list. Trade discount in quantities.

J. SKINDERVIKEN, Inventor and Sole Manufacturer

154 W. Randolph St., MAIL ORDERS ONLY. Chicago, Ill.
CITY SALES HANDLED BY MONARCH STATIONERY CO., 128 N. LA SALLE ST., CHICAGO, ILL.

Some Experimental Regenerative Tuners

(Concluded from page 20)

coils are shunted by similar condensers, for tuning.

Fig. 3 gives the circuit of the tickler set, and while both antenna and plate coupling is variable, the former might have been fixed, altho this is not advisable. The antenna coil consists of 40 turns of No. 22 DCC on a three-and-one-quarter inch ball, coupled to the secondary coupling coil, composed of 14 turns of the same wire on a four inch tube, the winding being split in the center to permit the passage of the shaft for the ball. The secondary leader is similar to the secondary coupling coil, and the tickler resembles the primary

in all respects except that it is coupled to the secondary leader. All tuning is done with two 700 mmf. condensers, one in the ground lead and the other in shunt with the secondary coils.

These sets when built had no tapped coils, and were mounted on panels respectively 5" x 14", 10" x 10", and 10" x 12", and all included tube controls. The second was in use at station 2UD for several months, and the first and last are now in use mainly for short wave telephone reception.

All three gave excellent results, and it is to be hoped that any one attempting to build similar sets will experience as gratifying results as did the builders of these.



THE NEW
Radio
Magnavox

Same Patents
ELECTRODYNAMIC

Same Volume of Sound as
THE RADIO TELEMEGAFONE

NEW PRICE

\$ **45**

Dealers Wanted

The Magnavox Co.
OAKLAND,
CALIF.

Something New In Headsets

With recent improvements in our Navy Type Headset we have succeeded in bringing out a headset with an A.C. resistance of 50,000 ohms at 800 cycles, a thing which has never before been accomplished in a commercial headset. It has a natural high pitch and will bring a thousand cycle notes clearly and distinctly and undamped waves can be read clearly and distinctly through static.

The improved Navy is peculiarly adapted to vacuum tube reception.

They are permanently adjusted at their highest point of efficiency and then carefully matched in tone. Because of their rugged construction they remain adjusted indefinitely.



"Navy Type"—50,000 Ohms A.C.,
weight 9 ozs. complete with head
band and polarity indicating cord.

Price, \$14.00.

It is equipped with an improved headband made of galvanized piano wire covered with strongly woven khaki. It is instantaneously adjustable to any size head and check nuts hold the adjustment.

It is also equipped with new style conducting cords which indicate the polarity of the receivers. This eliminates any danger of demagnetizing the receivers when used in connection with vacuum valve detectors.

The most exacting comparative tests have convinced us that our High Impedance Navy Type Headset is the best on the market regardless of price. It is the most sensitive, most durable, and at the same time the lightest high-grade head-set built. Our guarantee stands back of every one of these claims.

If you need a reliable and super-sensitive headset, you cannot afford to be without this new high-impedance model. Send us \$14 and we will mail you a Navy Type Headset. Try it for 10 days. If you are not absolutely satisfied with your purchase, return the headset and we will refund the money immediately.

C. BRANDES, Inc.

Room 821

32 Union Square, New York City

Also makers of

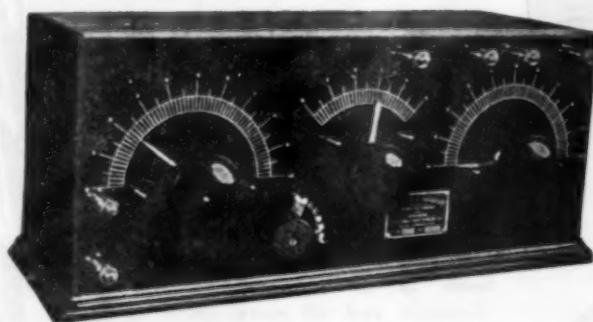
Trans-Atlantic Headsets.

2,800 ohms D.C. \$12.00

Superior Headsets, 2,000 Ohms, D.C. \$8.00

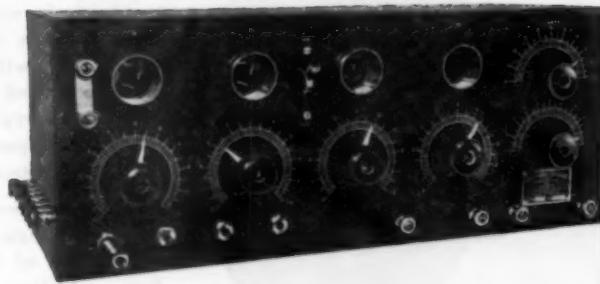
Send 5c for catalog "F".

THE SET THAT MADE THE TRANSCONS POSSIBLE



"Z-NITH"
REGENERATOR.

"Z-NITH"
AMPLIFIGON.
Type AGN-3.



Used by 9ZN throughout the record-breaking transcons in copying 1AW, 2RK, 5ZA, 6JD, 6ZH, 7CC, linking the Atlantic and Pacific.

Equip your set to do the same. Our new bulletin F-21, out March 1st, tells all about these sets as well as the new Z-Nith Multiceiver and many other novel features. If your name is not on our mailing list, write us.

The
CHICAGO RADIO LABORATORY

1316 Carmen Avenue
5525 Sheridan Road—(Station 9ZN)
CHICAGO, ILL.



Remler No. 810

PANEL TYPE

Jr. Rheostat

PRICE \$1.00

TEEN thousand Remler rheostats now in service testify to the value and merit of No. 810. The resistance unit is renewable (an exclusive feature) and is mounted on a bakelite disc. End stop and off position are provided. The knob is of polished bakelite 1 1/8" diameter and all metal parts in front of panel are polished nickel. The contact arm is nickel plated spring brass. This rheostat is as smooth running as a coupler switch and only two holes need be drilled to mount it. Resistance 4 ohms, carrying capacity 1 1/2 amps. Designed especially for vacuum tube filament control.

No. 81 Remler panel type rheostat of similar design and appearance is a larger unit of 3 amp. carrying capacity. For controlling the filaments of a group of amplifier tubes or the filament of a 5 watt power tube. PRICE.....\$1.75

FREE: Remler catalog is now ready. Send for your copy.

DEALERS: Remler Apparatus offers a merchandising opportunity. Send for full particulars.

Apparatus that Radiates Quality

Mfd. By

Remler Radio Mfg. Co.

E. T. CUNNINGHAM, Sales Mgr.

163 Sutter St., San Francisco, Calif.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS



TYPE C-300
\$5.00

This is only one of many letters already received. Let me know your results—if they are exceptional I should like to publish them.

CUNNINGHAM

TYPE C-300

THE IDEAL AMATEUR TUBE

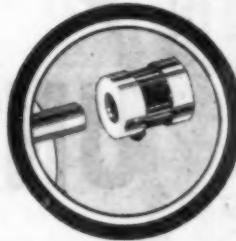
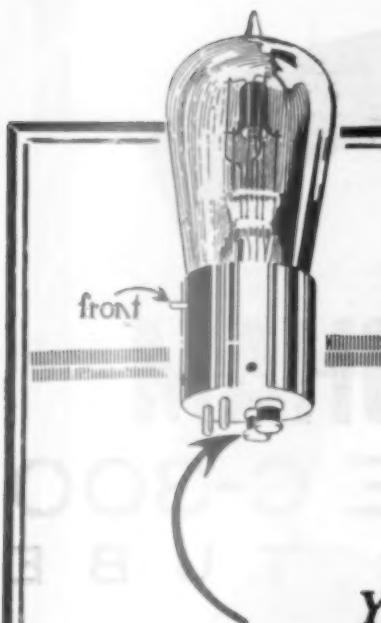
Read What 6BJ Says:

"No doubt you would like to know the wonderful work I have accomplished using your new C-300 Detector Tube. Since I have installed your tubes at my station located at Burlingame, California, call 6BJ, I have heard more distant amateur stations than I have ever heard in my life. I have been a constant user of vacuum tubes for the past ten years, and believe me, I know a real tube when I see it. I have succeeded in hearing stations in Nebraska and Arizona with only one step of amplification and have established communication with many that I never before could hear. You have my permission to use this letter so the many amateurs throughout the United States will know what I think of your most excellent tube. I use regenerative tuning with Radio Shop Variometers."

(Signed) HALL BERRINGER.

TRADING AS
AUDIOTRON MFG. COMPANY
35 MONTGOMERY STREET, SAN FRANCISCO

See Our Feature "Ad" on Page 88



Specifications:

Carrying capacity 1 Amp.
Size 1-4" over all.

You Cannot Burn Out a Bulb Protected Like This!

DEALERS!

Every radio man in your territory will find the "RADECO" Safety Fuse a money saving necessity. This business is yours if you stock up quickly. Let us know at once. We will send you attractive discounts by return mail.

Both for every operator now using a bulb and for all experimentors who have not added vacuum tubes to their sets because of the cost and loss involved in burning out, this tiny fuse, attachable directly to the filament terminal of any vacuum tube is worth its weight in gold.

There is no necessity of burning out a \$5 to \$19 Vacuum Tube which can be perfectly protected by the

"RADECO" Safety Fuse For Vacuum Tubes

(Pat. Pending)

3 for \$1 Postage Prepaid

This fuse is designed to protect the bulb against any amperage ordinarily used in amateur or commercial radio.

It is easily applied directly upon the filament terminals of any standard tube used with any standard socket. Simply clean filament terminals and slip on. It does not interfere

in any way with the sending or receiving efficiency of the station. Although one fuse will offer adequate protection, two fuses—one over each filament terminal—will protect the filament indefinitely.

A "short" is unknown to the tube protected with a "RADECO" Safety Fuse.

*Every radio operator in the United States
needs the "RADECO" Safety Fuse.
Send certified check or money order today.
Your order filled by return mail.*



"RADECO" Bindo-Post

Something new. Increases carrying capacity 100%. Machine made. Nickel-plated. Will not cut finest wires. Turn screw cap to set sliding lug. Order by mail today.

Each
30c
Large

Each
25c
Small

Radio Equipment Co.

630 Washington St., Fourth Floor Boston 11, Mass.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

CO-OPERATIVE RADIO PURCHASING

Co-operate with thousands of other amateurs. Buy your equipment from a single source and get immediate delivery on all your radio needs. Besides securing service you will participate in a division of the associations profits. Send us a trial order for any of the following items, or other wants, and see for yourself how this plan operates; or send stamp for details.

AMPLIFIERS (Without Tubes)		13.10
Grebe single stage.....	\$25.00	16.90
Grebe single stage with control.....	47.00	14.60
Grebe two stage.....	50.00	21.60
Grebe two stage and control.....	70.00	32.60
Clapp-Eastham one stage panel.....	18.00	36.00
Acme Y-2 single stage.....	13.00	18.70
AMPLIFIER PARTS.		32.60
Moorhead VT Amplifier tube.....	\$7.00	39.40
Murdock VT Receptacle.....	1.00	48.40
Acme new mounting transformer.....	5.06	
Federal open circuit jack.....	.70	
AERIAL SWITCHES.		VARIABLE CONDENSERS
Clapp-Eastham improved type.....	\$12.50	.001 m.f. encased.....
Murdock new type.....	4.50	.0006 m.f. encased.....
AUDION CONTROLS. (Without Tube)		.0011 m.f. interior.....
DeForest P-100 cabinet.....	\$67.50	.0006 m.f. interior.....
DeForest P-400 cabinet.....	13.25	No. 366 43 plate.....
DeForest P-401 without cabinet.....	10.90	No. 366 interior.....
Grebe tube unit complete.....	12.50	No. 368 23 plate.....
Clapp-Eastham control panel.....	12.00	No. 368 interior.....
Paragon control panel.....	6.00	.001 panel type.....
Acme detector unit.....	10.00	.0005 panel type.....
AUDION CONTROL PARTS.		TELEPHONE RECEIVERS.
Moorhead electron relay.....	\$6.00	Murdock 55 2000 ohm set.....
Radiotron detector tube.....	5.00	Murdock 55 3000 ohm set.....
Radio service socket.....	1.10	Brandes "Superior".....
G. A. Condenser and Leak.....	.50	Brandes "Transatlantic".....
Paragon panel mounting rheostat.....	1.75	Brandes "Navy type".....
Federal single circuit jack.....	.70	Baldwin Type "C".....
B. BATTERIES		Baldwin Type "E".....
Standard No. 7623 22½ volt small.....	\$1.50	Western Electric 2200 ohms.....
Standard No. 7625 22½ volt large.....	2.65	
Standard No. 7650 22½ volt variable.....	3.50	
Cyclone 22½ volt small.....	1.25	
Cyclone 22½ volt large.....	2.40	
Eveready 22½ volt small.....	2.25	
Eveready 22½ volt large.....	3.50	
Eveready box of 10 flashlight cells, 45 volt.....	3.50	
PARTS FOR COMPLETE RECEIVING SET		
Murdock loose coupler.....		\$9.00
Murdock No. 368 condenser.....		3.75
Murdock crystal detector.....		.70
Murdock phone condenser.....		.70
Murdock 2000 ohm receivers.....		4.50
Complete equipment.....		\$18.65
UTILITIES RECEIVING PARTS		

STORAGE BATTERIES

STORAGE BATTERIES
Paul M. Marko & Co. of Brooklyn N. Y. having
reduced their prices 10% to us we are reducing
last prices accordingly.



4 v. 20-40 amp. hour.....\$9.70

4 v. 40-60 amp. hour	13.10
4 v. 60-80 amp. hour	16.90
6 v. 20-40 amp. hour	14.60
6 v. 40-60 amp. hour	17.10
6 v. 60-80 amp. hour	21.60
6 v. 80-100 amp. hour	32.60
6 v. 100-120 amp. hour	36.00
8 v. 20-40 amp. hour	18.70
8 v. 60-80 amp. hour	32.60
8 v. 80-100 amp. hour	39.40
8 v. 120-140 amp. hour	48.40
VARIABLE CONDENSERS	
Chelsea .0011 m.f. encased	\$5.00
Chelsea .0006 m.f. encased	4.50
Chelsea .0011 m.f. interior	4.50
Chelsea .0006 m.f. interior	4.00
Murdock No. 366 43 plate	4.75
Murdock No. 366 interior	4.25
Murdock No. 368 23 plate	3.75
Murdock No. 368 interior	3.25
Murdock .001 panel type	4.00
Murdock .0008 panel type	3.25
TELEPHONE RECEIVERS.	
Murdock 55 2000 ohm set	\$4.50
Murdock 55 3000 ohm set	5.50
Brandes "Superior"	8.00
Brandes "Transatlantic"	12.00
Brandes "Navy type"	14.00
Baldwin Type "C"	16.50
Baldwin Type "E"	20.00
Western Electric 2200 ohms	15.00
PARTS FOR COMPLETE RECEIVING SET	
Murdock loose coupler	\$9.00
Murdock No. 368 condenser	3.75
Murdock crystal detector	.70
Murdock phone condenser	.70
Murdock 2000 ohm receivers	4.50
Complete equipment	\$18.65
UTILITY RECEIVER PARTS	
Unit coil holder	\$1.90
600 meter coil	1.70
Murdock .001 condenser	4.75
DeForest crystal detector	2.60
G. A. phone condenser	.35
Murdock 2000 ohm phones	4.50
AUDION RECEIVER PARTS	
Bakelite panel	\$1.50
Coil holder	1.00
2000 meter coil	1.80
Chelsea Condenser	4.50
Binding posts	.50
Acme detector unit	10.00
Brandes Superior phones	8.00
	\$15.80
PARTS FOR REGENERATIVE RECEIVER	
Bakelite panel	\$2.50
2 variometers	10.50
2 large dials	3.40
1 small dial	1.30
1 Varis coupler	7.50
Binding posts	1.00
	\$27.30
AMRAD CABINETS	
4 $\frac{7}{8}$ " x 4 $\frac{7}{8}$ " x 6 $\frac{1}{8}$ "	\$2.00
9 $\frac{7}{8}$ " x 4 $\frac{7}{8}$ " x 6 $\frac{1}{8}$ "	3.25
10" x 10" x 10"	9.85
	\$26.20

MUTUAL PURCHASERS ASSOCIATION

2 Stone Street, New York, Dept. C.

Never in the History of Radio Were These Prices Approached

Improved Navy Type Receiving Transformer again reduced from \$27.50 to the **\$16.95** startling price of

Improved Arlington Receiving Transformer again reduced from \$15.00 to the **\$7.75** startling price of

Substantial reductions on many other radio instruments in our catalog No. 14.

Price list showing reductions and many new items mailed on request.

"The Greatest Radio Catalog in the World—"

The Universal Verdict of Tens of Thousands of Radio Amateurs.

Duck's No. 15 Big 225 Page Wireless Catalog—Just Out.

Mail 12c

In stamps or coin (not sent otherwise) for this big catalog.



A Veritable Treasure House of Everything Worth While and Dependable in Radio. The largest, most comprehensive, artistic and educational wireless catalog published. The Beacon Light to guide you right in the selection of your radio purchases, and at prices that will command your attention. Every instrument guaranteed with privilege of return if not satisfied.

Other Substantial Reductions On Items in Catalog No. 14.

No. R40 Receiving Set.....	\$22.50	Nos. 50, 51, 52	Switch Contacts, each.....	.03
No. R41 Receiving Set.....	38.50	No. 1023 Mica Condenser.....	.60	
No. R41a Receiving Set.....	28.50	No. B670 Detector.....	2.75	
THORDARSON TRANSFORMERS		No. A862 Detector.....	2.75	
1 K.W. Type R.....	\$40.00	No. A1915 Detector.....	1.50	
1/2 K.W. Type R.....	28.00	No. A367 Murdock Condenser.....	4.50	
1/2 K.W. Type R.....	22.00	No. A1002 Receiving Set.....	9.75	
1 K.W. Type RS.....	30.00	No. A1916 Condenser.....	1.65	
1/2 K.W. Type RS.....	20.00	No. 61x10 Tuning Coll.....	2.95	
1/4 K.W. Type RS.....	15.00	No. 61x10 Tuning Coll.....	4.95	
No. A1792 Thordarson Transmitting Condenser.....	25.00	No. 14 Aluminum Wire per lb.....	.90	
Only a Few of the Many New Radio Instruments in Catalog No. 15.		All Binding Posts Reduced.....	33 1/3 %	

Type C-300 Cunningham Detector Bulb..... \$5.00

Type C-301 Cunningham Amplifier Bulb..... 6.50

UV-200 Radiotron Detector Bulb..... 5.00

UV-201 Radiotron Amplifier Bulb..... 6.50

Type C-302 Cunningham 5 Watt Power Tube..... 8.00

Type C-303 Cunningham 50 Watt Power Tube..... 30.00

Type C-304 Cunningham 250 Watt Power Tube..... 110.00

Note: All detector and amplifier tubes and 5 Watt Power Tube shipped prepaid.

No. A200 Control Panel for above detector

bulbs, complete less bulb, only..... \$7.50

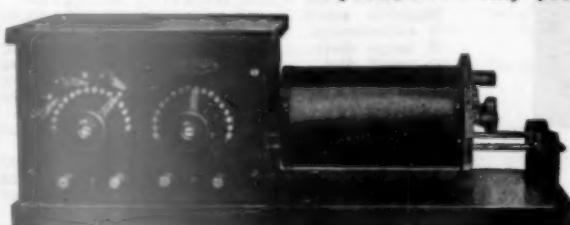
The workmanship on the above detector set

actually warrants double the price asked. Our

new catalog contains a complete line of new

detector and regenerative, and amplifying sets.

**Model 5BB Navy Type Receiving Transformer, Regular Price \$27.50.
Special Price only \$16.95**



A big improvement over our former model. Primary divided into four sections, with three dead end switches, greatly improving selectivity. Secondary divided into three sections, with two dead end switches, eliminating harmonics. The change in the construction of the guide rod support makes it possible to obtain a looser coupling. It is a wonderful improvement over our old model, both in appearance and performance.

THE WILLIAM B. DUCK CO. 243-245 Superior St., Toledo, Ohio

There is one thing more pleasing than Radisco prices,—*the actual performance of Radisco apparatus*

You can sometimes equal Radisco quality, but never at Radisco prices. Every single instrument sold by Radisco dealers, under the Radisco trade mark, is unquestionably the best buy on the market, for its particular purpose. You can always count on Radisco equipment for dependable performance.

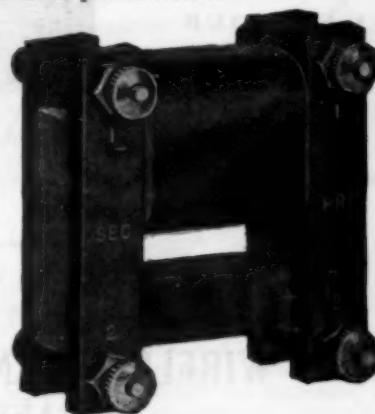
The close co-operation of Radisco instruments is an additional feature that adds much to the efficiency of the complete Radisco station, without adding one cent to the cost.

A. R. CO. Amplifying Transformer

Unusual quietness and ease of operation distinguish the station equipped with the A. R. CO. transformer. In designing this piece of apparatus, particular reference was given to the correct ratio of impedance and turns between primary and secondary.

Another feature which makes this transformer a desirable piece of apparatus, is the simple but very effective mounting of bakelite strips, supporting the laminated closed core and coil, allowing for quick mounting in case or on panel.

A-4 Amplifying Transformer - - \$5.00
Shipping weight 2 pounds



THESE PROGRESSIVE DEALERS CARRY THE ENTIRE RADISCO LINE.

ALBANY, N. Y.
Shotton Radio Mfg. Co.
8 Market St.

ASHEVILLE, N. C.
Hi-Grade Wireless Instrument Co.

ATLANTIC CITY, N. J.
Paramount Radio Supply
518 N. Connecticut Ave.

BIENVILLE, QUEBEC, CAN.
Canadian Radio Mfg. Co.

BOSTON, MASS.
Atlantic Radio Co.
88 Broad St.

BROOKLYN, N. Y.
Kelly & Phillips,
512 Flatbush Ave.

CHICAGO, ILL.
Chicago Radio Laboratories
1816 Carmen Ave.

EUREKA, ILL.
Klass Radio Co.
Branch, Peoria, Ill.

KANSAS CITY, MO.
McCreary Radio Supply
4th and Delaware Sts.

LOS ANGELES, CALIF.
The Wireless Shop
511 W. Washington St.

MONTREAL, P.Q. CANADA.
J. B. Miller
136 Vendome Ave. N.D.G.

**NEW BRUNSWICK,
NEW JERSEY**
Geo. N. DeLaplaine
306 George St. and
8th & Magnolia Sts.

NEW ORLEANS, LA.
Rose Radio Supply,
604 Gravier St.

NEWARK, N. J.
A. H. Corwin & Co.
4 West Park St.

OMAHA, NEBRASKA
O-B Radio Supply Co.
406 Brown Building

PHILADELPHIA, PENN.
Philadelphia School of Wireless Telegraphy
Broad and Cherry Sts.

PROVIDENCE, R. I.
Rhode Island Elec. Equip. Co.
45 Washington St.

PITTSBURGH, PENN.
Radio Electric Co.,
3807 Fifth Ave.

PORTLAND, ME.
Atlantic Radio Co.,
15 Temple St.

SEATTLE, WASH.
Northwest Radio Service Co.
609 Fourth Ave.

SCRANTON, PENN.
Shotton Radio Mfg. Co.
P. O. Box 8
Branch, 8 Kingsbury St.
Jamestown, N. Y.

TORONTO, ONT., CAN.
The Vimy Supply Co.
567 College St.

WICHITA, KAN.
The Cosoradio Co.
1725 Fairmount Ave.

RADIO DISTRIBUTING CO.,

This mark



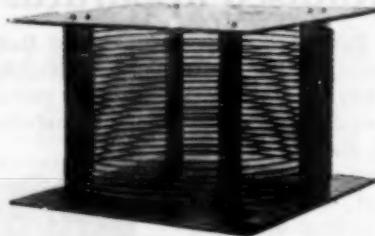
Newark, N.J.

your guarantee!

C-W C-W C-W C-W C-W C-W C-W C-W

Prepare for the bad radio season by installing your CW outfit now. It will carry thru summer static and is ideal for relay work.

OUR C-W CATALOG
WILL BE READY
ABOUT MARCH 15th,
SEND FOR YOUR
COPY NOW.



OUR NEW C-W
CATALOG WILL
BE THE MOST
COMPLETE AND
BIGGEST — CW
ONLY.

CW Inductance No. CW-100 shown above, mounted on Formica exclusively—25 turns edgewise copper strip $3/16 \times .050$ " complete with connection clips, **\$10.00**.

Send 15 cents for catalog, which amount may be deducted from first order of One Dollar or more.

"8ZV" WIRELESS MANUFACTURING CO. "8ZV"
CANTON, OHIO

BURGESS "B" BATTERIES

SEVERAL
SIZES
FOR
SPECIAL
WORK



SEND FOR CATALOGUE
**BURGESS BATTERY
COMPANY**
HARRIS TRUST BLDG. - CHICAGO, ILL.

THE EV-RA-LAB TYPE "D" AUDION CONTROL UNIT.



Type "D"

The EV-RA-LAB Type "D" is a neat and highly efficient instrument with its price within the range of all. Has a seven point switch for varying the high voltage battery. This is absolutely necessary when soft or receiving tubes are used. This detector may be used with any type of tube on the market. These features make it the Unit for you.

Price without cabinet..... \$12.00
Price with oak cabinet..... 15.00
Eveready tapped B Battery 45 V..... 4.50

Send for Our Bulletins

Evansville Radio Laboratory
1103 S. Third St., Evansville, Ind.

TURNEY SPIDER-WEB INDUCTANCE COILS

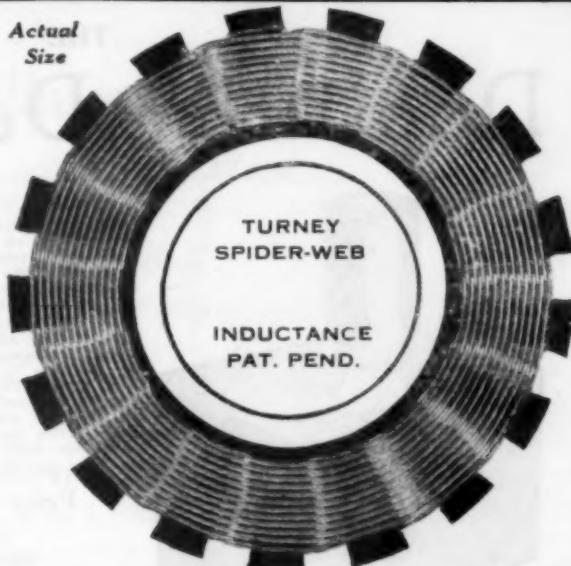
Built at Radio Hill---



THE WINDING showing angle at crossing. This style of winding has four distinct and exclusive advantages.

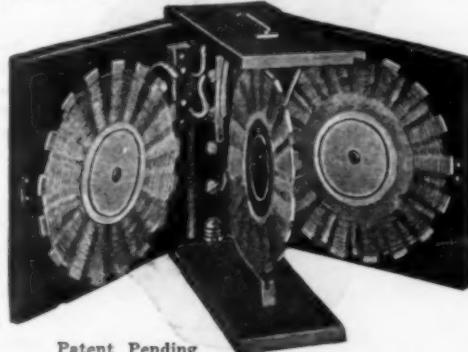
1. MORE INDUCTANCE—There is no magnetic leakage in coupling. The coils are flat, and the entire magnetic area is available.
2. LESS DISTRIBUTED CAPACITY. The wire runs parallel for a greater distance, and crosses itself less frequently than in any other coil known.
3. LOWER HIGH FREQUENCY RESISTANCE. There being no interior magnetic field, or air core, high frequency resistance is reduced to a minimum.
4. OCCUPIES LESS SPACE. The coils are so thin that three of them are less than $\frac{1}{4}$ inch in width.

Actual
Size



UP AT the foot of the Berkshires, amid inspiring surroundings, nestles Radio Hill. This ideal radio location is the scene of the development of the Turney Spider-web Inductance Coils. Here, far from any outside influence, Eugene T. Turney, Radio Engineer, the man who developed the Crystaloi Detector, has brought forth a sensational improvement in machine wound coils.

Below is shown the Turney complete receiving unit. It contains three Spider-Web Coils, the secondary and tickler being adjustable to the primary. The doors are capable of exceedingly fine adjustment. Six Binding posts allow for almost any type of circuit. With two condensers, .0005 and .001, this unit will respond to wave-lengths of 175 to 400 meters. The results will give you a new idea of radio efficiency.



Patent Pending
Illustration shows front of cabinet removed

Dimensions, $4\frac{1}{2} \times 5 \times 1\frac{1}{2}$
PRICE SIX DOLLARS COMPLETE

Order direct from this advertisement. Send check or money order for \$6.00 plus postage, and your Spider-Web Unit will come forward at once. OR write us for New Booklet, explaining the Spider-Web principle in detail.

EUGENE T. TURNY LABORATORIES, Inc.
RADIO HILL, HOLMES, NEW YORK

Progressive dealers are invited to write for our interesting sales offer on Turney Complete Units.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS



(PATENT APPLIED FOR)

The Wavemeter is the Yard Stick of the Radio Art. In tuning up a Spark or C.W. set, and in countless laboratory experiments it is the ultimate source of reference. But the Wavemeter does not tell the whole story because it does not measure the Logarithmic Decrement, the factor which tells whether the energy radiated by your set is concentrated in a single sharp wave of great intensity or spread over a broad band of wave-lengths where it causes QRM and reduces your range.

The Doolittle Decrementer is both a superior Wavemeter and a Decrementer. The Wave-Length and Decrement can be obtained simultaneously, without complicated calculations. The range is 180-300 meters. An ideal instrument for radio Clubs as well as individuals. Immediate delivery can be made.

Price - - - \$25.00

SEND FOR BULLETIN 107R
DESCRIBING THIS INSTRUMENT

F. M. DOOLITTLE CO.
817 Chapel Street, New Haven, Conn.



Chelsea Variable Condensers *(Die Cast Type)*

No. 1—.0011 m.f. mounted.	\$5.00
No. 2—.0006 m.f. mounted.	4.50
No. 3—.0011 m.f. unmounted.	4.75
No. 4—.0006 m.f. unmounted.	4.25
Bakelite dial only.	.75

Top, bottom and knob are genuine bakelite shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates.

Unmounted types will fit any panel and are equipped with counter-weight.

Purchase from your dealer; if he does not carry it, send to us. Bulletin sent upon request.

Chelsea Radio Co., 15 Fifth St., Chelsea, Mass.

Manufacturers of Radio Apparatus and Moulders of Bakelite



LOOK—Only \$18.00

This new regenerative tuner gives marvelous results. It brings in 200 to 600 meter stations great. Just the thing for radio phone. Signals are clear as a whistle.

Send 2-cent stamp for bulletin 111.

Colby's Telegraph School, Auburn, N. Y.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

"Shramco Oscillation-Transformer"

We offer this specially designed O-T of correct dimensions for amateur wave-lengths. Constructed of the highest grade material throughout.

SPECIFICATIONS

PRIMARY: 4 turns heavy 1" Copper Ribbon mounted on Formica strips.

SECONDARY: 8 turns heavy 1" Copper Ribbon mounted on Formica strips.

BASE AND UPRIGHTS: Hard wood, mahogany finish. Both Coils movable. Fully guaranteed.

Cat. No. 60—SHRAMCO O-T, with 4 SHRAMCO Shielded O-T Clips.....\$10.00

Cat. No. 60—SHRAMCO O-T, without clips.....9.00

Cat. No. 61—SHRAMCO Shielded O-T Clip......30

Shipping weight 10 lbs. Postage extra.



"Licensed Under Marsh Patent
No. 811859."

"Shramco Reo"

Panel type rheostat of the best material obtainable. Resistance element "NI-CHROME" mounted on electrical asbestos block. All metal parts brass. Spring phosphor bronze blade. Even regulation and smooth operation. Fully guaranteed. Base 3" dia. Overall height 2½". Shipping weight 1 lb. Postage extra.

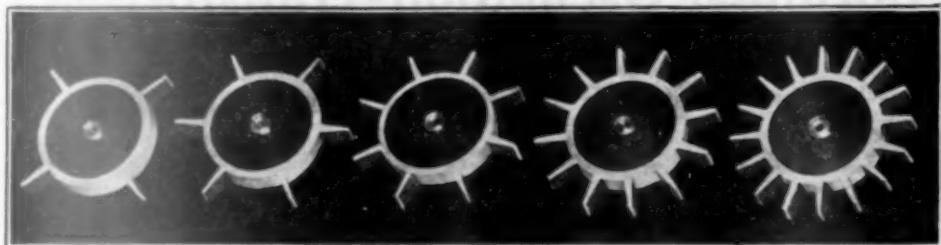
Cat. No. 90—“SHRAMCO REO”—Resistance 6 ohms.....\$2.00 each

Special resistances made to order.

Send 5c in stamps for Catalog K.

Shotton Radio Manufacturing Company
P. O. Box 3, SCRANTON, PA.

THE BENWOOD "SUPER" ROTARY DISC
 Again we have
SOMETHING NEW



Lighter than the old-style BENWOOD discs and yet has the same wide sparking surface. The teeth are longer and far more accurate than has ever been produced before. Complete disc weighs only one-half pound when fully made up. Is of ample size for any 1 KW installation and yet is so light and evenly balanced that the smallest fractional high speed motor will run it with ease.

Diameter, 6 inches
 Width, $\frac{1}{4}$ inch
 Weight, $\frac{1}{2}$ pound

Is complete with black fibre center and heavy brass bushing with set screw for fastening to the motor shaft. This is the identical disc that is furnished with the new "SUPER BENWOOD" rotary quenched spark gap.

As shown by the cut these discs are furnished in 4, 6, 8, 12 and 16 points at no extra charge, merely specify which type you desire. Drilled to fit any sized motor shaft; just designate the size of the shaft on your motor. Each bushing is drilled twice and then reamed to the size desired, thus assuring the purchaser of the utmost accuracy.

ONLY \$7.00 Each

Specify size of motor shaft.

THE BENWOOD COMPANY, Inc.

1300 Olive Street,

St. Louis, Mo.

JEWELL THERMO-COUPLE METERS DO NOT LIE

They register the antenna current accurately.

Duration of current flow does not change reading.

Permanently adjusted — No zero shift.

Used by U. S. Army, U. S. Navy and Commercial Companies.



Picture your set equipped with an accurate, sensitive, durable ammeter.

Make your picture real.

BUY A JEWELL

Price:

0-3 amp. \$15.00

0-5 amp. 15.00

0-10 amp. 15.00

Prompt Deliveries.

Pattern No. 25 Jewell Thermo-Couple
 Shipping Weight 30 lbs.

DOUBLEDAY-HILL ELECTRIC CO.

RADIO DEPT.—DESK A

715 12th St., N. W., WASHINGTON, D. C. 719-21 Liberty Ave., PITTSBURGH, PA.

COMPLETE RECEIVING SYSTEM—\$25

Aerial System, Cabinet Set, Buzzer Test and Phones

Write for Bulletin R.

EASTERN RADIO LABORATORY

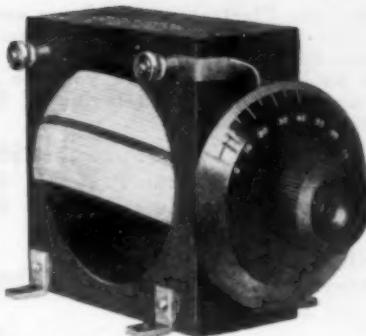
West Fort Lee.

New Jersey

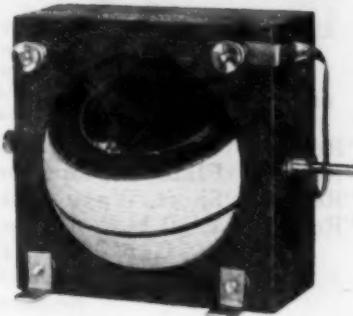
TUSKA VARIOMETER

PATENT PENDING

Moulded Throughout



Type 200—with knob and dial
Price - - \$7.25



Type 201
Price - - \$6.25

FACTS

ELECTRICAL

Lowest losses—Highest inductance. No capacity losses thru the use of shellac. Best Insulation of any Vario-meter ever built. Perfect connections. No loose leads. The peerless vario-meter.

MECHANICAL

Moulded Composition throughout. NO WOOD. No possibility of shrinking or warping. Minimum separation between stator and rotor coils. Moulded stator windings; will never come out.

Special Introductory Offer:

Tuska Variometer Sent Postpaid During Month of March.

Send 5c for C.W. and Variometer Booklets.

These Dealers Carry TUSKA "C.W." ACCESSORIES In Stock.

ATLANTIC RADIO COMPANY, Inc.,

88 Broad St., Boston, Mass.

GEO. S. SAUNDERS & COMPANY,

11 Devonshire St., Boston, Mass.

F. D. PITTS COMPANY,

12 Park Square, Boston, Mass.

LEO J. MEYBERG COMPANY,

428 Market St., San Francisco, Calif.

CAESAR KLAUS,

Eureka, Ill.

DETROIT ELECTRIC CO.,

56 Shelby St., Detroit, Mich.

PHILADELPHIA SCHOOL OF WIRELESS TELEGRAPHY,

Parkway Bldg., Brook and Cherry Sts., Philadelphia, Pa.

DOUBLEDAY-HILL ELECTRIC COMPANY,

719 Liberty Ave., Pittsburgh, Pa.

A. H. CORWIN & COMPANY,

4 West Park St., Newark, N. J.

AMERICAN ELECTRO TECHNICAL APPLIANCE COMPANY,

235 Fulton St., New York, N. Y.

CONTINENTAL RADIO AND ELECTRIC CORP.,

6 Warren St., New York, N. Y.

MANHATTAN ELECTRICAL SUPPLY CO., Inc.

New York, Chicago, St. Louis

THE LINZE ELECTRIC CO.,

1129 Olive St., St. Louis, Mo.

THE C. D. TUSKA CO.,

HARTFORD, CONN.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS



RELAY SPARK GAP MOTOR

Announcement

Realizing the difficulty amateurs are having in securing good Variometers and short wave Couplers for Regenerative sets, this Company has taken steps to fill that need.

We regret that our Electrotyper has been unable to produce cuts for this issue. These instruments are ready for immediate delivery. These and a few minutes spent in hooking up will give you the best regenerative set on the market at a saving of from twenty-five to sixty dollars.

"Relay" Grid Variometer—DX-1	\$8.00
"Relay" Plate Variometer—DX-2	8.00
"Relay" Short Wave Coupler—DX-3	6.50
"Relay" 1/10 H.P. 110 volt, 60 cycle, 3400 R.P. M. Induction Spark Gap Motor (gives approximately 240 cycle tone with our 8 point disc), introductory price.	25.00
Regular price.	\$30.00
Disc	8.00

Using one of these Gaps 8ZR was heard six inches from the fones at 6EJ, J. Vance Wise, Walnut Grove, California, on January 19, 1921.

Large stock of all leading apparatus.

IMMEDIATE DELIVERIES.

ORDER AT ONCE.

THE AMERICAN RADIO SALES AND SERVICE CO.

Great American Bldg.,

Mansfield, Ohio

Why try to "read 'em and—weep"? Use a K-52 short wave set, and weep no more. We also carry a complete line of parts for short wave sets.

J.J.N. Variometer	.....	\$4.50
J.J.N. Vario-coupler	.....	5.00
EMCO Variometer	.....	7.00
K.R. EMCO Vario-coupler	.....	6.50

Send for Catalogue "Q 15"

DAVID KILLOCH COMPANY

57 Murray Street

New York City, N. Y.

A Sure Winner!

Something To Remember

RA-COND RHEOSTATS
Licensed under the Marsh Patents.

SPECIFICATIONS:—

Rayo Element (Nichrome)
The Perfect Resistance Element.

Auto-Bronze
(Registered)

Our Patented Alloy—An Electrical and
Bearing Metal.

X-X Grade Bakelite

MICROMETER RHEOSTAT

A NEW TYPE

For critical adjustments and laboratory
uses.

\$1.50 Each

PANEL TYPE

\$1.30 Each

BULLETINS ON REQUEST.

Special Cam-Mounting Rheostats on
Quotation.

RADIO EQUIPMENT COMPANY

1525 No. Fawn St., Philadelphia

RAOLITE ELECTRIC SHOP

116 Federal St., Camden, N. J.

AMATEURS:

Your dealer will
gladly show you
Firth Radio Spec-
ialties.

DEALERS:

Write for our
literature and
sales-producing
displays.



World's Records with Baldys

WE have written several of the Relay men who helped to accomplish the wonderful Trans-continental Relay Records on January 18th. Every one from whom we have heard states that he used the world famous Baldwin Mica Diaphragm Amplifying Telephones.

Mr. V. M. Bitz (6JD) of Los Angeles writes: "They helped a great deal to accomplish the results I obtained in the Trans-continental relay. I will recommend Baldwin phones to all who are looking for the very best."

Mr. R. H. G. Mathews (9ZN) of Chicago Radio Laboratories says: "We use Baldwin phones altogether in our Relay work and in fact have no others in our station."

Mr. H. P. Maxim (1AW) of Hartford, Conn., and Mr. Louis Falconi (5ZA) of Roswell, N. M. also used Baldwins and have practically the same to say as the above. Space limits publication.

On January 4th Mr. H. D. Selvage of Irvington N. J. with improved Type E Baldwins broke previous world records for Amateur long distance reception—3300 miles. He called to see us the other day and praised Baldies most highly.

Many letters testify that Baldwin phones are equivalent to 1 and 2 stages of amplification—therefore, they are the most economical phone you can buy at any price.

Made in 3 styles at 3 prices. Booklet Q1.

BROWNIE ADJUSTABLE PHONES: Absolutely the best metal diaphragm phone on the market. With the adjustable feature you not only match the two units with one another but actually with the desired signal—thus eliminating interference. Light in weight, rugged and low in price \$12.50 complete. One unit with cord—ideal for loudspeaker \$6.00. Ask your dealer to show them to you and give you booklet Q2.

JOHN FIRTH & COMPANY, Inc.

18 Broadway, New York City

Firth wireless Products

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

PRICE REDUCTION ON JUPITER AERIAL WIRE

"Genuine Jupiter"

1c per foot
\$9.00 per 1000 ft.

"JUPITER" allows your transmitter energy to radiate from a broad surface of pure copper at a minimum resistance. The old original at the old price. Strong and flexible. You can't afford to waste time with any other kind. Orders filled day received. Shipping weight 15 lbs. per 1000 feet. Send postage to avoid delay. No C.O.D's.

Complete Aerials

Estimates given on complete aerials for those who are not in a position to make their own. Wire cut to length and aerials made to dimensions. Shipped complete or unassembled. Nothing but "JUPITER" pure copper strand used in all aerials made to order. Be sure and send complete dimensions.

"Jupiter Special"

2c per foot
\$15.00 per 1000 ft.

Same as regular "JUPITER" but of double size. Made of the same pure copper to fill a demand from the real relayer for a larger wire. Strong and flexible. Double strength and double conductivity. This size in use at 1AW for over a year and also in use at 1GY. Shipping weight 28 lbs. per 1000 feet. No C.O.D's.

LEE A. BATES

8 MOEN ST., WORCESTER, MASS.

RADIO 1GY

A.R.R.L. Supt.

CEN. MASS.

Get a Copy of Our Wireless Manual H-12

We ask 25 cents for it, give a coupon receipt for the amount which coupon when returned with an order will be credited at 25 cents.

As the edition is limited, if you desire a copy, send the 25 cents and get it now for future reference.

It contains 200 pages, fully illustrating and describing the many instruments used in Radio service. Forty-five pages are devoted to general instructions, diagrams, station calls, tables, codes and other information identified with the art. The book is printed on highly finished paper with a two-color cover; size 9x5 1/4 inches.

With a large and varied supply of wireless instruments and accessories carried in stock, we are in position to fill any order or meet any condition promptly and accurately.

We have experts in charge of our wireless departments, so do not hesitate to consult us about your wireless problems. Proper attention and accurate information is yours for the asking.

MANHATTAN ELECTRICAL SUPPLY CO., Inc.

17 Park Place, New York; 114 So. Wells St., Chicago; 1106 Pine St., St. Louis; 604 Mission St., Frisco.

VACUUM TUBE CONTROL UNIT

Type MW

Adapted to any modern hook-up. Best appearing and highest type Vacuum Control Unit at the price in the market.

Grained formica panel, 5 1/2" x 6 3/4", lettered in white, graduated rheostat dial, variable plate control. Tube socket (standard 4 prong).

Grid condenser and leak mounted in back of panel and so wired that it can be adapted to any modern hook-up.

WRITE for descriptive Booklet MW. Sent free on request



Price \$10

Parcel post prepaid in U. S. A.
Immediate shipment.

THE MIDWEST RADIO CO., Dept. E., 3423 Dury Ave., Cincinnati, O.

Another Grebe Triumph!

150-3000 Meters.

After much experimental work, we have succeeded in adapting the Armstrong Regenerative circuit to a receiver having a wave-length range of 150-3000 meters. The result is the



Type CR-5
Regenerative
Receiver



This is a complete receiver. The only additional equipment needed are phones, batteries and a detector tube.

Included in its range are amateur, navy and commercial wave-lengths, special land stations, ship CW stations, navy low-wave arcs, all radio phone work and "Time". In operation, it is the last word in simplicity.

Ask to see it at your dealer's today.

GREBE RADIO apparatus is licensed under
the original Armstrong and Marconi patents.

Central Radio Institute, Independence, Mo.
Continental Radio and Electric Corp., New York
Detroit Electrical Co., Detroit, Mich.
Doubleday-Hill Electric Co., Pittsburgh, Pa.
Electrical Specialty Co., Columbus, Ohio
Holt Electric Utilities Co., Jacksonville, Fla.
Hurlburt Still Electrical Co., Houston, Texas
Kelly and Phillips, Brooklyn, N. Y.
U. of I. Supply Store, Champaign, Ill.

Klaus Radio Company, Eureka, Ill.
Manhattan Electrical Supply Co., New York,
Chicago, St. Louis.
Leo. J. Meyberg Co., San Francisco, Cal.
Pacent Electric Co., Inc., New York City
F. D. Pitts Co., Inc., Boston, Mass.
Philadelphia School of Wireless Telegraphy,
Philadelphia, Pa.
Western Radio Electric Co., Los Angeles, Cal.

A. H. GREBE & CO., Inc.

74 Van Wyck Blvd., Richmond Hill, N.Y.

A RAY-DI-CO "HYLO"



THE DOUBLE DUTY MACHINE

Supplies the high voltage for the plates. **ELIMINATES DEAD** storage batteries at critical moments, **NO MORE** troublesome CHARGING, **NO** spilling of ACIDS.

One turn of the switch and you are supplied with the filament current as well as the plate current. The most effective operating point of the tube is often dependent upon a critical filament voltage and a discharged battery may lose you a DX record.

Built in capacities from 30 watts to 175 watts. Voltages from 100 to 500 volts for the plates, and from 4 to 10 volts for the filaments. Can be used for receiving circuits, power amplifiers, etc. Special voltages if desired. Prices upon request.

RAY-DI-CO

(Ray-Dee-Ko)

RADIO 9AG

Chicago, Ill.

— QST READERS —

If you want us to continue to support QST with half page ads., we must have more of your business. Read the Acme, A-P Radio Corp., C-E, Gen. Radio, Grebe, Chelsea, DeForest, Federal, and Murdoch catalogs; note the latest prices, and send us your order.

Don't bother to include postage on less than 10 lbs.—as we pay the postage!



PRICE REDUCTION TO **\$6.00** METERS
0-3 and 0-5 amps.—0-50, 0-100, 0-300 and 0-500
Millamps.

PRICE REDUCTION TO **65 CENTS** ON HC COIL ADAPTOERS
Real bakelite insulation—adjustable arms.
ALL CHELSEA PRODUCTS CARRIED IN STOCK.
SOMERVILLE RADIO LABORATORY
WINTER HILL, 45, MASS.

This is the
NUCLEUS
of a 50-250
watt tube
transmitter.

Consists of
panel, etc.,
meters, con-
denser and
microphone.
Additional in-
struments at a
tached to
meet your
individual
requirements.

6-18c binding
posts and
booklet on
practical
operation, in-
cluded gratis.
ON TYPE J

METERS
0-3 and 0-5 amps.—0-50, 0-100, 0-300 and 0-500
Millamps.

PRICE REDUCTION TO **65 CENTS** ON HC COIL ADAPTOERS

Real bakelite insulation—adjustable arms.

ALL CHELSEA PRODUCTS CARRIED IN STOCK.

SOMERVILLE RADIO LABORATORY

WINTER HILL, 45, MASS.

I'll Tell the World

—they satisfy!

WHAT?—RADIOTRONS

U.V. 200 Detector.....	\$5.00
U.V. 201 Amplifier.....	6.50
Complete V.T. Control Panel.....	6.00

FEDERAL AMP. TRANSFORMERS
are designed for the new RADIOTRONS

Price **\$7.50**

And listen man! You'd walk a mile to get
one of the new

TURNEY SPIDER-WEB INDUCTANCES
Complete short wave regenerative

tuner..... **\$6.00**

Don't walk—write for illust. booklet.

Cage Type Fil. Rheostat.....	\$2.00
Parkin 0.001 M.F. Variable Cond....	2.00

G.A. Grid or Phone Cond.....	.35
------------------------------	------------

G.A. Grid Leak Cond.....	.50
--------------------------	------------

If you want to get that RADIO MUSIC
SWEET and CLEAR, get a pair of
"BALDIES"

Type E—Improved.....	\$20.00
----------------------	----------------

Type F—Light weight.....	21.00
--------------------------	--------------

Single Loud Speaker Unit.....	10.00
-------------------------------	--------------

Doolittle "AMPLIFONE".....	20.00
----------------------------	--------------

Doolittle D-remeter-Wavemeter.....	25.00
------------------------------------	--------------

Send stamp for our Bulletin.

RADIO SUPPLY SERVICE

46 Clinton Pl., Mt. Vernon, N. Y.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

ANNOUNCEMENT!

NOISELESS
BALL-BEARING
VIBRATIONLESS

ELECTRICALLY
PERFECT

J-RAY
NOISELESS
ROTARY
SPARK GAP

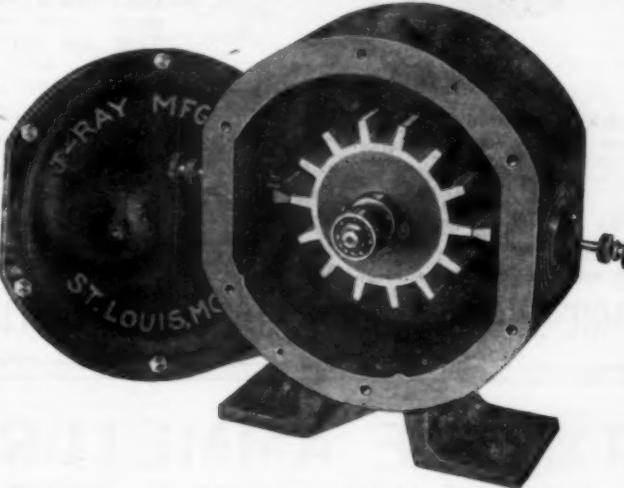
FIRST ENCLOSED
ROTARY GAP WHICH
REALLY OPERATES
NOISELESSLY

MECHANICALLY
PERFECT

Makes Biggest Hit at A.R.R.L. Convention at St. Louis December 28-30.

An ideal improved Rotary Gap designed and built for practical use and long life.

Operate your station Night or Day without disturbing anyone with a SILENT J-RAY ROTARY SPARK GAP.



Noise, Heat, and Insulation troubles are entirely eliminated by the thickness of the heavy iron walls of a J-RAY GAP case. The Rotor of a J-RAY operates almost frictionless on two new-departure ball bearings—making it silent mechanically as well as electrically.

Terrible crash of One K.W. spark is not heard through the heavy iron walls of the NOISELESS J-RAY.

If it's a clear distinct note through a heavy QRM, It's a J-RAY GAP.

Makes operating a pleasure—eliminating all nerve-wracking noises.

INSULATION TROUBLES ENTIRELY AVOIDED—because the heavy iron case of a silent J-RAY GAP remains practically cold even after hours of use under one K.W., and insulators are not subjected to heat strain which causes expansion and eventual electrical break-down. The THREE INCH diameter and ONE and ONE-QUARTER INCH thickness of J-RAY insulators prevent insulation trouble.

Bearing trouble is not possible because the J-RAY GAP RUNS on two ball bearings allowing it to be driven at high speeds with the smallest amount of friction and noise.

The **DISC** of a silent J-RAY GAP is different than any other disc now used. The teeth are cut tooth by tooth on an automatic gear machine which produces a disc **EVERY DIMENSION OF WHICH IS** Calipered to 1000th part of an inch. It is machined from a special alloy bronze which has been formulated only after long research and experiments. This bronze alloy under intense heat forms a very hard amalgam which burns very slowly with hardly any powder or oxide—most essential for use in a closed gap.

The **QUENCHING** effect of the bus bar copper electrodes and this alloy bronze disc cannot be surpassed.

The **TEETH** of the J-RAY GAP are one and one-quarter inches wide, thus assuring the highest possible radiation.

Special aluminum disc can be furnished if desired.

PRICE COMPLETE—\$50.00

F.O.B. ST. LOUIS, MO.

J-RAY MACHINE-CUT DISC ONLY \$10.00 F.O.B. ST. LOUIS, MO., 8 OR 14 TEETH. STATE SIZE OF SHAFT WHEN ORDERING.

J-RAY NOISELESS ROTARY GAP
AND MACHINE CUT DISKS
NOW ON DISPLAY BY
MANHATTAN ELEC. SUPPLY
COMPANY
1106 PINE ST., ST. LOUIS, MO.

J-RAY M'F'G CO., 2131 DeKalb St., St. Louis, Mo.



Pat. applied for.

Seven reasons why you should have HURRADIOS:

- | | |
|---|--|
| 1. 50% less radio frequency resistance. | 4. Wider range of wavelength. |
| 2. Distributed capacity NIL. | 5. Compact and rugged in construction. |
| 3. Greater selectivity. | 6. No metal bearings or shafts. |
| 7. PRICE, F.O.B. Cleveland. | |

Variometers with Amrad Knob and Dial.....	\$7.00 each
Vario-couplers with Amrad Knob and Dial.....	\$7.00 each
Complete set, 2 variometers, 1 vario-coupler.....	\$21.00

RADIOELECTRIC SHOP, Dept. Q, 919 Huron Rd., Cleve., Ohio

"SIGNALS QSA"

That's what the users
of Huradio Variometers
say.

Are you satisfied with the
results that you are getting?
You can get better results
with HURRADIOS. No station
complete with them.
Huradio Variometers are
the results of months of
study and experimenting.
They are built scientifically
correct, and mechanically
correct.

HOT WIRE AMMETERS

We have on hand a large stock of Roller-Smith Type TAW
Hot Wire Ammeters, with ranges of 0-1, 0-2.5, 0-5 amperes.

We are offering these at the remarkably low price of **\$6.50**
each, postpaid.

Send 10c in stamps for our catalogue.

The Radio Electric Company

3807 Fifth Ave., S.,

Pittsburgh, Penna.

"Z-NITH"

The One Symbol of Absolute Supremacy

Superior in Design, Workmanship and Performance.

"Z-NITH" Regenerator, \$65.00—Audion Detector, \$20.00
Jeweler's Time Receiver, \$75.00—Motor-boat Receiver, \$75.00

Will Call on Radio Amateurs of New Jersey in Vicinity.

Write for particulars of "Z-NITH" apparatus to

ARTHUR HAAKE,

WEST NORWOOD, N. J.

RADIO APPARATUS

Distributors of Reliable Radio Apparatus to Schools, Colleges, Radio Clubs and Experimenters All Over the World!

"PITTSCO"

The Sign of Service!
All We Ask is a Chance
to Prove It!



AMPLIFIERS

No. RORJ Grebe 2 step.....	\$50.00
No. RORK Grebe 2 step with automatic filament control.....	55.00
No. RORD Grebe Det. and two step Amplifier with filament control.....	75.00

AMPLIFYING TRANSFORMERS

No. 226-W Federal.....	\$7.50
No. A-2 Acme unmounted.....	4.50
No. A-2 Acme semi-mounted.....	5.00
No. A-2 Acme mounted.....	7.00

AUDION CONTROL PANELS

No. RORA Grebe in cabinet, hinged top, splendid value.....	\$12.50
No. RORH Grebe in cabinet with tickler connections.....	17.00
No. ZRD Clapp-Eastham, latest.....	12.00
No. P-1 Paragon—Adams-Morgan's latest product	6.00

"B" BATTERIES

No. 7623 Small Standard's 22.5 V.....	\$1.50
No. 7625 Large Standard's 22.5 V.....	2.65
No. 7650 Large Standard's 22.5 V. Variable in steps 1.5 volts.....	3.50
No. 703 Set of 10 flashlight cells 45 volts.....	3.50

COILS—Litz.

No. L-300—while they last.....	\$1.95
No. L-750—while they last.....	2.70
No. L-1000—while they last.....	2.95

CONDENSERS (Variable)

No. C-1 Connecticut .001 mfd.....	\$6.50
No. C-1 Connecticut .001 mfd, panel mtg.....	6.50
No. 1 Chelsea .0012 mfd, mtd.....	5.00
No. 2 Chelsea .0006 mfd, mtd.....	4.50
No. 3 Chelsea .0012 mfd, unmtd. with New Bakelite Dials.....	4.75
No. 4 Chelsea .0006 mfd, unmtd. with New Dials.....	4.25
No. 5 Chelsea Dial, $\frac{1}{4}$ " or $\frac{1}{2}$ " shaft, 0-180°, splendid value.....	1.00

CONDENSERS (Fixed—Grebe)

No. ROCC Grebe .0002 mfd.....	1.00
No. ROCD Grebe .0005 mfd.....	1.20
No. ROCE Grebe .001 mfd.....	1.60
No. ROCA Grebe .0005 and .5 megohm.....	1.20
No. ROCB Grebe .0005 and 3 megohm.....	1.20

HOT WIRE METERS

No. 127 General Radio 1, 2, 3, 5 or 10 amperes, flush or front of board.....	\$7.75
--	--------

OUR NEW CATALOG #22 IS OUT!

It Contains Over 100 Pages, 150 Illustrations and 600 Items. Send 10 Cents in Stamps for It. Not ONE Radio Man Should Be Without It!!!

F. D. PITTS CO., INC.
12 PARK SQUARE, Dept. A, BOSTON 11, MASS. U. S. A.

Rotary Quenched Spark Gap, \$20 POST PAID
With Universal 110 V. Motor Attached, \$25.



are of copper with Bakelite insulation.



**Chelsea
Dial
Indicator
\$1.00**

3 1/4" diameter—moulded of real Bakelite—accurately centered, and at right angles to the 3/4" brass insert hole.

Cunningham
C-300
Audiotron
\$5.00

44 V. Variable "B" Battery \$3.60

Include postage on 4 lbs.
Complete in handy wooden case and adjustable phosphor bronze "jiffy" connectors. Better than such batteries—if one 4.4 V. unit weakens prematurely, it can be removed and replaced—therby not impairing total voltage, which makes this the best battery value to be had at any price. Set of 10 Renewal Units, 44 volt, \$3.10 postpaid.

PARAGON FILAMENT RHEOSTAT
For Back or Front of Panel Mounting. 6 ohms,
1 1/2 amps., 1 1/4" dia.

\$1.75 Postpaid

Standard VT Socket

Improved Contact Type

\$1.00 Postpaid

Copper foil condenser 35c p.p.

AERIAL WIRE 1c. PER FOOT

7 strands No. 22 copper—tin plated to prevent oxidation. Maximum radiation and strength. Include postage on 15 lbs. per 1000 ft.



Honeycomb Coil Adaptor \$1.50 PER PAIR

Attach to binding post of any variable condenser, insert H-C coil, making a tuning unit. Two units make a loose coupler, a third makes a tickler coil, one makes a wavemeter.

Radio Equipment Co. 630 WASHINGTON ST., Boston, Mass.
4th Floor

* AMATEURS—DEALERS AND JOBBERS *

DEMAND RTS CONDENSERS

AMATEURS—Your set will not function properly if you do not use the RTS CONDENSERS.

REMEMBER—RTS CONDENSERS are backed by a reputation, which guarantees quality and satisfaction.

★RTS | GRID CONDENSERS .0005 MF..... EACH 30c Postage 3c
GRID CONDENSERS AND GRID LEAK .0005 MF.. 50c Postage 3c
FIXED PHONE CONDENSERS .0013 MF..... 40c Postage 3c

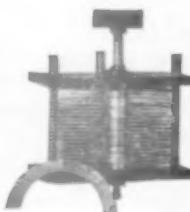
DEALERS—If you have not already received our RTS Condenser Discount Sheet, we will gladly send same on request from you.

RADIO TESTING STATION, - - BINGHAMTON, N. Y.

THE WORLD'S CONDENSER MARKET

Knocked-Down Condensers

Assemble them and save money.



11 Plate.....	\$1.80
21 Plate.....	2.25
41 Plate.....	3.20 Add P. P.

If you want us to assemble them for you add \$1.00, plus P. P., to above prices. Shipping weight 2 lbs.

Glass Plate Condensers—Universal Condensers.

SEND 10c FOR CATALOG OF 16 PAGES TO

T R E S C O

Davenport, Iowa



TEL.
BACK BAY
5964

899 BOYLSTON ST.
BOSTON, MASS.



DO YOU KNOW ? ? ?

That the EASTERN RADIO INSTITUTE offers more undeniable advantages to those interested in studying Commercial Radio than any other school in New England, if not in the country?

DO YOU KNOW that the EASTERN RADIO INSTITUTE is the OLDEST, LARGEST and BEST EQUIPPED radio and telegraph school in New England?

To make this unmistakably clear we can give the following facts:—

The EASTERN RADIO INSTITUTE was founded in 1913 and is now OVER SIX YEARS OLDER than ANY OTHER Radio and Telegraph school in New England! All schools starting before us are NO LONGER IN EXISTENCE !!! WE ARE THE PIONEER SCHOOL.

The EASTERN RADIO INSTITUTE actually has HUNDREDS of earnest and intelligent students now in attendance. We have given instruction at this date to over 4000 different students and have actually enrolled, graduated and placed more Commercial operators than ALL OTHER SCHOOLS IN NEW ENGLAND COMBINED!

The EASTERN RADIO INSTITUTE is equipped with THOUSANDS and THOUSANDS of dollars worth of splendid panel spark sets, Federal Arc apparatus, panel receiving sets, storage battery equipment etc. !

DO YOU KNOW that the EASTERN RADIO INSTITUTE has ALWAYS placed every graduate in a good position, kept them employed and can actually GUARANTEE these positions?

DO YOU KNOW that our graduates may be found all over the world as Chief Operators, Teachers in other Radio Schools, Chief Radio Inspectors, Engineers, Directors of Corporations, Superintendents, etc.?

DO YOU KNOW that we are the ONLY school in New England giving instruction upon actual Federal arc apparatus?

DO YOU KNOW that our systematically planned and thoroughly executed course of practical instruction positively brings RESULTS?—Your Commercial first grade license.

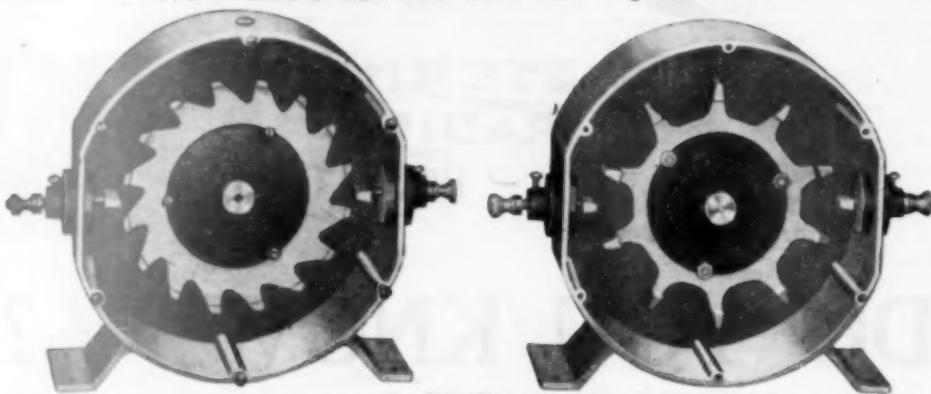
Certainly these advantages must be apparent to you. Besides it costs no more to take our course thus availing yourself of our YEARS of RESULTS and SUCCESS. SUCCESSFUL graduates of the EASTERN RADIO INSTITUTE are found all over the world! Why not be one?

Day and Evening classes. Start any Monday.

Our latest, illustrated prospectus is free. If you cannot visit the Institute send for one. If there is any further information or assistance our organization can give you please command me!

Sincerely Yours, F. D. PITTS, Director.

NOW LET'S SETTLE THE GAP QUESTION!



K 20A—With Motor
PRICE - - - - - \$25.50

K 20B—Pulley Drive Only
PRICE - - - - - \$20.00

Much has been said and claimed for various rotary gaps offered for experimental use. The production of the new Karlowa gap, has embodied all the features with none of the faults. The price is much lower than competitive articles.

The rotor of the 20a is the famous saw-tooth design, of machined cast aluminum with bakelite center. Gap is driven by a universal AC-DC 110 volt motor. The 20b uses a ten-point rotor with $\frac{3}{4}$ " faces, and is supplied with pulley for drive with a fractional horsepower motor. Does not require a $\frac{1}{4}$ HP. Perfect quenching with small air resistance, owing to rotor construction.

Both types are provided with ample BAKELITE BUSHINGS, and suitable for use with 1 KW transformer. Cases are polished aluminum, with polished face plate. This gap is guaranteed electrically, mechanically, and from an insulation standpoint. Ready for IMMEDIATE DELIVERY.

Send 4c Stamps for New Catalog.

The Karlowa Radio Corporation

MAIN OFFICE—611 BEST BLDG.,

ROCK ISLAND, ILL.



Some People

LISTEN

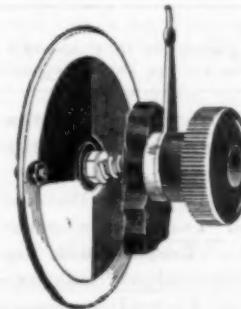
to WEAK signals,
OTHERS use New
ERA Detectors and
Amplifiers.

Type 1D Detector Panel.....	\$10.00
(with high voltage adjustment)	
Type 2D Detector Panel.....	9.50
(without high voltage variation)	
Type 1A One Step Amplifier.....	15.00
(panel only)	
Cabinet for either detector or amplifier.....	3.00
Type 2B New ERA 22½ Volt B Battery.....	2.75
RICO-Vacuum Tube Socket— Bakelite-Dilecto shell with Formica Base. Non melting	
Single, \$1.00; Double, \$2.00; Triple, \$3.00	
Six Step Grid Leak.....	1.50

Send for descriptive circular.
Postage paid to any part of U.S.

The Eastern Radio Company
939 D St. N.W., Washington, D.C.

A NEW INVENTION



The PARKIN .001 mf. Variable Condenser (pat. pending) fills the long felt want for a rugged, low priced, balanced, variable condenser for panel mounting. No plates to bend and short circuit. Cannot get out of order. Has very low minimum capacity. Easily mounted, only one small hole being necessary in the panel.

Guarantee: ALL PARKIN Variable Condensers are sold subject to return within 5 days if not fully satisfactory.

No. Postpaid
50. Unit only. May be mounted on any shaft. \$1.50
51. With knob, pointer, etc., as shown in cut. 2.00
52. With knob, etc., and 3" black dial..... 2.50

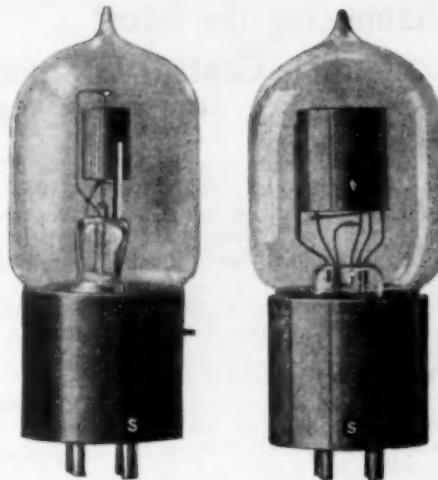
Write for full description of this new
invention. Ask for circular No. 17.

Dealers: Write for discounts.

PARKIN MFG. CO., San Rafael, Calif.

FOR EFFICIENCY—

A combination of two or more A-P VT tubes as amplifiers with an A-P Electron Relay as the initial detector or oscillator, is the ideal receiving combination for long distance amateur or long wave reception. *Only with such a combination can full efficiency be attained.*



The A-P VT Amplifier-Oscillator, equipped with the SHAW standard, four-prong (condensite) base—price \$7 and worth it. Buy from your dealer.

The A-P Electron Relay, equipped with the SHAW standard, four-prong (condensite) base. Price \$6 and worth it. For sale by your dealer.

THE BEST TUBES MADE

the proof

3,000 miles transmission. There's a DX record for you, and there are others, many others—with A-P tubes. Results count—that's what you're after, isn't it? Results prove that A-P tubes are the best tubes made, the tubes *you* should use; and here are some of the results:—

1. Using three *A-P transmitting tubes* in a radiophone set, Hugh Robinson of Keyport, New Jersey, not only transmitted phonograph music, but actually *talked to Scotland*, and was distinctly heard on three separate occasions during November and December, 1920. Distance covered approximately 3,100 miles by great circle.
2. With a single *A-P Electron Relay* an amateur in New York (name on request) repeatedly hears communications between California amateur spark stations.
3. San Francisco amateurs (names on request) regularly receive day and night European communications from Carnarvon, Nauen, Bordeaux, and Rome, with moderate single-wire antennas and a single *A-P Electron Relay*.

For sure results, for better results, use A-P tubes and only A-P tubes. Licensed by the Radio Corporation of America under DeForest Audion and Fleming patents, for amateur and experimental use in radio communication. Equipped with the SHAW standard, four-prong (condensite) base.

ATLANTIC RADIO SUPPLIES CO.
8 KIRK PLACE- NEWARK-NEW JERSEY

PACIFIC RADIO SUPPLIES CO.
638 MISSION ST.-SAN FRANCISCO-CAL.

Distributors for Moorhead Laboratories, Inc.

Announcing the latest Audion Control Cabinet "The KO-RAD"

Quantity production enables us to offer the "Ko-Rad" Control Cabinet at only **\$10.00**.

This instrument incorporates features that are not excelled by any at treble our price.

Orders now being booked for February 15th delivery.

Oak cabinet "Early English" finish, size 5" x 5 1/4" x 4" deep. Genuine grained finish bakelite panel.

Shipping weight 5 lbs.

Standard VT socket, Paragon Rheostat, and fixed grid condenser, all back mounted on the drawer type panel, making the interior quickly accessible for inspection.

Variable grid leak, and hard rubber binding posts. Presenting an appearance that any station may well be proud of.

Place your order early. If your dealer can not supply you, order direct from this advertisement.



Complete ready to hook up, only
\$10.00
without bulb or batteries.

JOHN R. KOCH

Manufacturer and Distributor
Radio Apparatus and Supplies.
200 Capitol St.,

Charleston,

West Virginia

"If It's Radio We Have It"

We list below a few good values from our large and complete stock, which in addition to our own products, includes accessories manufactured by other reliable concerns.

Amplifying transformer.....	\$5.00
Bamboo Spreader, 12 ft.....	2.25
Electrose Insulator 10 in.....	.75
Electrose Insulator ball.....	.35
Lightning Switch.....	4.50
Antenna Switch.....	4.50
B. Batteries 22 1/2 V—1200 hour capacity.....	3.50
B. Batteries 4 1/2 V—200 hour capacity.....	.40
Variable Condenser, Conn. .001.....	6.50
Variable Condenser, C.E.Bal. .001.....	9.50
Variable Condenser, Murdock .001.....	4.75
Baldwin navy type receiver.....	16.50
Brando superior receiver.....	8.00
Murdock receivers, 5000 ohms.....	\$4.50 & 5.50
Marko storage batteries, 6 V. 40 A.....	16.25
Marko storage batteries, 4 V. 40 A.....	10.75
E. R. Det. tube.....	6.00
Amplifier tube.....	7.00
Transmitter tube.....	7.50
Radiotron Det. tube.....	5.00
Ace V.T. Socket with grid leak.....	1.50
Wixico Coil mounting, table.....	8.00
Wixico Coil mounting panel.....	6.00
Mail orders receive prompt attention. Send 3c stamp for catalogue.	

The Precision Equipment Co., Inc.

2437-2439 Gilbert Ave.

CINCINNATI, Dept. D, OHIO

"You May Pay More But You Can't Buy Better."

FREE!

A LIMITED NUMBER OF COPIES OF THE LATEST CONSOLIDATED RADIO CALL BOOK HAVE JUST REACHED US FROM THE PUBLISHERS

A COPY WILL BE SENT YOU ABSOLUTELY FREE OF CHARGE IF YOU SEND US \$2.50 FOR A FIFTEEN MONTHS' SUBSCRIPTION TO

PACIFIC RADIO NEWS

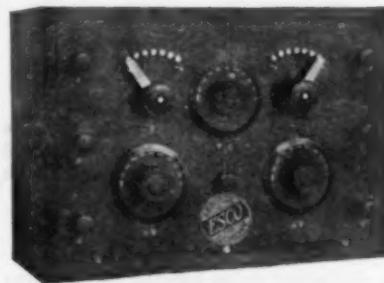
This Offer Positively Expires on April 30th.

**SUBSCRIBE NOW
OR EXTEND YOUR PRESENT
SUBSCRIPTION**

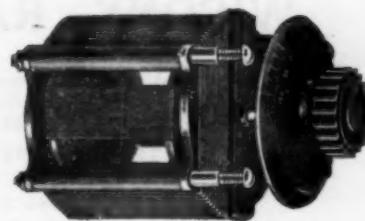
**YOU SAVE
\$1.50 on this offer.**

**PACIFIC RADIO PUBLISHING CO.
50 MAIN ST., SAN FRANCISCO**

The ESCO Regenerative Receiver



THE SET



THE VARIOMETER

This is to announce the arrival of a new type of vario-coupler and variometer of an entirely revolutionary design.

The ESCO regenerative receiver combines the above instruments to such good advantage that unparalleled results are being reported by its use.

The vario-coupler is made of Bakelite; no wood is used in its construction and as a result we have an instrument that is not only more efficient but also very superior to those now on the market. The windings themselves are unique in that the primary and secondary are in most places only separated by air instead of the usual wood forms now in common use. This cuts down dielectric losses to almost nothing. In fact these windings are separated from each other by a space less than 1/32 of an inch in width. In consequence very fine tuning is obtained. The primary of the coupler is controlled by two switches marked L and S. The S switch controls single turns for six turns and the L switch controls six turns at a time. The switch levers are laminated and made of the best nickel-plated phosphor bronze.

The variometers are manufactured on the same design as the coupler and are of the same excellent construction. The tuning of the set is effected by the Grid variometer and regeneration is controlled by the Wing variometer.

The wave length of the ESCO regenerative receiver is 150 to 500 meters and can be increased by use of a variable condenser in the circuit. The receiving range is greater than that of any similar set now on the market. Radio telephone reception is clear and loud because of the peculiar construction of the tuning instruments thru which extremely precise tuning can be accomplished. For short wave C.W. reception unbelievable distances have been covered.

The cabinet of the outfit is of quartered oak finished with the skill acquired only by long years experience in wood working. The panel is of black polished Formica and the dials are black Bakelite with graduations of 1-100. Binding posts are of black Bakelite.

On trial tests the following Radio telephone stations were heard:

WA-7—McCook Field, Dayton, Ohio
UC—University of Cincinnati
WL-1—Speedway, Indianapolis, Ind.
XF-1—Langley Field, Hampton, Va.
—Westinghouse, East Pittsburgh, Pa.

—Deahl Beach
NSF—Bureau of Standards
—Long Island
AXB—Precision Equipment Co.
2XX—Ossining, N. Y.

The price of the ESCO regenerative set is \$50.00 f.o.b. Columbus, Ohio. Shipping weight is 11 pounds. Order from us or through your dealer. Dealers write for our proposition.

Send 15c for our large illustrated catalogue. This amount will be refunded on your first order for \$1.50 or over. High printing costs make free distribution impossible.

The Electrical Specialty Company

Two offices for your convenience

Dept. M, 48-50 So. Front St.
COLUMBUS, OHIO

Dept. M, 20 N. 9th St.
PHILADELPHIA, PA.



Announcement in Re: **WICONY RADIO APPARATUS**

Having acquired new and greatly enlarged factory facilities in order to take care of the extraordinary demands being made on us by the government, commercial and foreign requirements, we beg to announce the consummation of an arrangement with

THE PACENT ELECTRIC COMPANY, Inc.

MR. LOUIS GERARD PACENT, Pres.

150 Nassau St., New York City

whereby that Company, and Mr. Pacent will act as exclusive sales agents for Wicony Products to the experimenter, amateur, educational and research trade.

Thus there is associated the most progressive manufacturers of High-Grade Radio Products and the most progressive selling agency in the country, through which their product will be distributed.

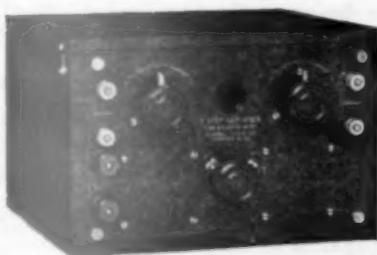
The result will be more and better service, as well as more and better apparatus for all.

WIRELESS IMPROVEMENT COMPANY

Radio Engineers, Manufacturers and Distributors.

47 West Street,

New York, N. Y.



TYPE 215

2 STAGE AMPLIFIER

An efficient, attractive, and reliable amplifier unit. By means of a special drum switch shift may be made from two stages of amplification to one stage or to detector. Switch controls both filament and telephone circuits. No plugs and jacks to bother with. Cabinet includes compartment for plate battery.

PRICE \$50. Described in Bulletin 906Q.

GENERAL RADIO CO. Cambridge 39, Mass.



7 Y G
330 meters—500—2 K.W.

Learn Radio

A vocation with wonderful opportunity to Travel and Study.

**Foreign Trade—Marine Engineering—
Navigation**

We offer thorough training in
Radio Operating and Engineering,
damped and undamped systems.
Complete Laboratory and Station Equipment.

OREGON INSTITUTE OF TECHNOLOGY
Portland, Oregon—Division Q.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

DO YOU KNOW?

That by building your own apparatus, you can save 25 to 75% and at the same time have the best known designs?

That our Engineers, all with many years of Commercial Radio Engineering experience, have designed a complete line of amateur equipment embodying all the very latest commercial research?

That all these designs have actually been tried, and that we guarantee entire satisfaction or will return your money on request without question?

That by entire satisfaction we mean that apparatus cannot be purchased that will prove more efficient than our designs if drawings are properly followed?

That we can supply the raw materials cut to size, at lower prices than you can secure from the manufacturer, inasmuch as we buy in large quantities?

That some of the designs include:

20 Watt C-W Transmitter.

10 Watt Radiophone Transmitter.

.01, 25,000 volt Mica Condenser.

1 K.W. Non-Resonant Transformer.

Relay Regenerative Receiver.

Audio Frequency Amplifying Transformer.

And many others.

Write us what you would like to construct, the prices we ask for the drawings and materials will please you, and the finished instruments will please you still further. Write now, no obligation on your part.

Our Engineers will also be glad to advise you in regard to any radio problem, answering questions of any sort. The charges are small from 25 cents up. Send your questions in and we will advise charges before answering.

Money Immediately Refunded to Anyone Not Completely Satisfied.

Experimenters Information Service

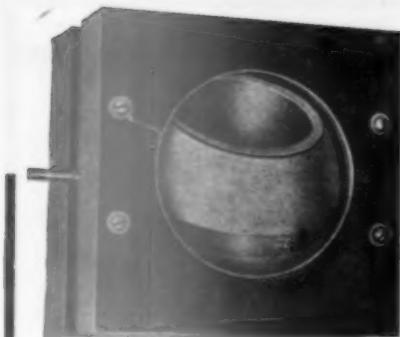
45 Pinehurst Avenue,

Suite 51

New York City

CHARLES R. LEUTZ, Director, Formerly Designing Radio Engineer, Marconi Wireless Telegraph Co. and Liberty Electric Division of the Mallory Industries, Inc.

EUROPEAN BRANCH: 17 GREEN STREET, LONDON W.C.2, ENGLAND



They don't wiggle

The price of some apparatus wiggles and wobbles, and the quality is doubtful as the price. Don't buy such apparatus—you are taking chances. Buy CESCO guaranteed apparatus. The quality is there. The price is right. And you can depend on both. They don't "wiggle"—if they're



"CESCO"

CESCO VARIOMETER—(Here you are)—accurately constructed of thoroughly seasoned, hard maple which will not warp, shrink, or crack. All windings bound and insulated with CESCO special impregnating compound. CESCO quality throughout. Buy from your dealer or order direct. Price \$8.50 postpaid. Order number V-100.

\$8.50

DEALERS—
WRITE US!

Any other supplies you need now? We have them. And your inquiries are welcome as your orders. We supply every want the way you want it supplied.

CALIFORNIA ELECTRIC SUPPLY CO.
643 MISSION STREET—SAN FRANCISCO—CAL.

DEALERS—
WRITE US!

"Radio Supplies That R Right"

CESCO VARIO-COUPLER—(Works fine.) Secondary is ball type. Primary consists of a threaded bakelite tube 4-in. in diameter and 2-in. high wound with large gauge, bare copper wire. Get it from your dealer or write direct. Price complete mounted on hardwood base for panel mounting—\$6.75. Order number C-100.

\$6.75

MAGNET WIRE

We are prepared to furnish best grade magnet wire on $\frac{1}{4}$ and $\frac{1}{2}$ lb. spools at the following prices.

PRICE PER $\frac{1}{4}$ LB. SPOOL

Size B & S Ga.	Single Cotton	Double Cotton	Single Silk	Enameled
No. 22	\$0.56	\$0.68	\$0.62	\$0.45
No. 24	.60	.77	.67	.47
No. 26	.65	.88	.71	.49
No. 28	.75	1.10	.85	.52
No. 30	.85	1.24	.97	.53
No. 32			1.15	.55
No. 34			1.52	.59
No. 36			1.77	.69

Price of $\frac{1}{2}$ lb. spools double above list.

All prices are net and include cost of spool and delivery charges via Parcel Post to any Post Office address in the United States; safe delivery guaranteed.

Send for Circular 21-A giving prices on other sizes, insulations and quantities of Magnet Wire. This circular lists "WIRE FOR EVERY WIRELESS PURPOSE".

KEYSTONE WIRE CO.
P. O. BOX 120, SCRANTON, PA.

The T & H Radio Co.

catalog has been delayed but your copy will be mailed as soon it is out of the printer's hands.

If you have not already sent us your name, DO IT NOW.

Catalog will be sent to any name in United States prepaid.

It is full of useful information and lists a complete line of radio apparatus.

T & H RADIO CO.
ANTHONY, KANSAS
"Order via 9LR"



HAVE YOU RECEIVED YOUR COPIES?

Two descriptive bulletins covering the dectector tube—Radiotron U.V. 200, and the amplifier—Radiotron U.V. 201, are now available to every amateur and experimenter in the United States.

These important bulletins contain practical circuits and detailed instructions which will enable the experimenter to obtain the maximum results from Radiotrons. If you have not already received copies, visit your local radio dealer and ask for them or write us direct—they are free.

DEPENDABLE PRODUCTS

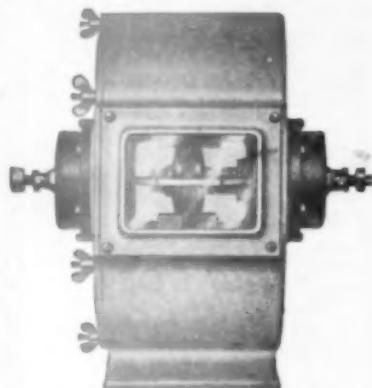
Radiotron U.V. 200	\$.50
Radiotron U.V. 201	\$.50
Standard Tube Sockets	1.50
Grid Leaks, Mounted	1.25
Grid Leak Units Only	.75
Grid Leak Mountings	.50
Intervalve Transformers	7.50
Burgess "B" Batteries	3.50

The Radio Corporation's tubes are covered by patents dated November 7th, 1905, January, 1907, and February 18th, 1908, as well as by other patents issued and pending. Tubes licensed for amateur and experimental use only. Any other use will constitute an infringement.

Dealers: Let us send you our selling proposition
Address all orders and inquiries to:

SALES DIVISION, COMMERCIAL DEPARTMENT

RADIO CORPORATION OF AMERICA
233 Broadway, New York City



\$55, F.O.B. Indianapolis
See description in last QST.

Clear as a Bell

The New Bell Rotary Quenched Spark Gap

THE FOLLOWING DEALERS can make prompt shipment of The Bell Gap:

Continental Radio & Elec. Corp., 6 Warren St., New York
Manhattan Electrical Supply Co., 1106 Pine St., St. Louis
The Newman-Stern Co., 1874 E. 6th St., Cleveland, Ohio
Philadelphia School of Wireless Telegraphy, Parkway Bldg.

Broad & Cherry Streets, Philadelphia, Pennsylvania
F. D. Pitts Co., 12 Park Square, Boston, Mass.
Quaker Light Supply Co., 728 Arch St., Philadelphia, Pa.
Radio Distributing Co., 4 W. Park St., Newark, N. J.
Radioelectric Shop, 919 Huron Road, Cleveland, Ohio
The Radio Electric Co., 3907 Fifth Ave., Pittsburgh, Pa.
Ravenswood Radio Co., 2044 Waveland Ave., Chicago, Ill.
H. J. Sackett Electric Co., 256 Pearl St., Buffalo, N. Y.
Shotton Radio Mfg. Co., 8 Market St., Albany, N. Y.
Shotton Radio Mfg. Co., Connell Bldg., Scranton, Penna.
C. D. Tuska Co., Hartford, Connecticut
William W. Harper, 334 E. 4th St., Ottumwa, Iowa

The Electric Machine Co., - - - Indianapolis, Ind.

Antenna Insulators

To be absolutely sure of your antenna's stability in insulation use insulators that will do it.



W.E.C. #1—
Ball Shape \$0.40



W.E.C. #2—
4" x 2" \$0.50



W.E.C. #3—
10" x 2" \$0.90

#3

2-Filament Audio-Trons \$5.00

Stranded Antenna Wire Per Ft. .01

100 amp. 600 volt Ground Switches .. 4.00

WRITE US FOR OUR SPECIAL TUBE
OFFER.

WHITALL ELECTRIC CO.

42 MAIN ST., WESTERLY, R. I.

CALL LETTERS 11AP

Hams—

Why not get in on the long wave stuff?

Use Radisco Coils

Here is a combination that gets fine results for everybody that uses it—

LRD 1200 for Primary

LRD 1200 for Secondary

LRD 550 for Tickler.

Special Introductory Offer—

This combination sent anywhere in the U. S., postpaid, for **\$6.00**. Send your order to-day. The coils will be shipped immediately, and you can start right in on your long range work.

Kelly & Phillips

312 Flatbush Ave., Brooklyn, N. Y.

More Than They Expected!

EVERY month since the Corwin Mail Order Service was started, hundreds of amateurs have ordered apparatus, expecting prompt shipments and fair prices. And invariably, the carefulness with which their orders were filled, and the perfect condition in which the goods

arrived, have even exceeded their expectations.

If you think that no mail order service can be thoroly satisfactory, perhaps a trial of Corwin Service will surprise you, also. See if you need any apparatus in this list.

Universal-Coil Mounting Plugs.

Anyone can easily make smooth-running mountings with these plugs. No bending, no filing, they are made to fit exactly, in the first place. Suitable for Radisco and all hand wound coils. A few minutes work with these plugs will save you dollars that can be put into better apparatus!

Price 80 cents, postpaid

VARIABLE CONDENSERS

A.R.CO. .001	\$6.25
A.R.CO. .0005	5.00
With No. 67 Dial add.	1.00
Murdock 366.	4.75
Murdock 367.	4.75
Murdock 368.	3.75
Clapp-Eastham 800.	7.50
Clapp-Eastham 800A.	9.50
Clapp-Eastham 800B.	11.50
Complete with dial	
Shipping Weight One Pound.	

GRID CONDENSERS

Radisco, postage 3c.	35c
----------------------	-----

ANTENNA SWITCHES

Murdock, 3 pounds	\$4.50
Clapp-Eastham, 10 pounds.	12.50

OSCILLATION TRANSFORMERS

Murdock No. 424.	\$5.00
------------------	--------

RADIO CRAFT PRODUCTS

Detector	\$15.00
Two step Amplifier	50.00
Detector and one step	45.00
Detector and two step	70.00

Postage paid.

"B" BATTERIES

Radisco No. 1 (2 lbs.)	\$1.50
Radisco No. 5 (5 lbs.)	2.65

Eveready Storage Battery

prices on application.

TUSKA C.W. APPARATUS

181 Coil (2 lbs.)	\$7.50
182 Coil (2 lbs.)	10.00
183 Coil (3 lbs.)	12.50
170 Filter (8 lbs.)	16.00

AERIAL WIRE

7x22 tinned copper	
100 feet 2 lbs.	\$1.25
200 feet 4 lbs.	2.40
500 feet 8 lbs.	6.00

AMPLIFYING TRANSFORMERS

A.R.Co. (1 lb.)	\$5.00
Federal (1 lb.)	7.50

JACKS AND PLUGS

Federal Closed Circuit	\$0.85
Federal Open Circuit	.70
Federal Double Circuit	1.00
Federal Plug	2.00

Postpaid

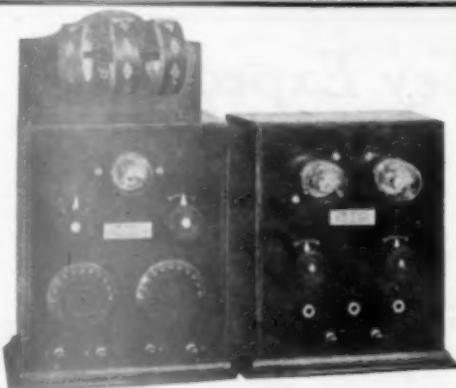
ALL RADISCO COILS and Wireless Press Books.

All orders for apparatus not listed as postpaid
must be accompanied by postage charges.

A. H. CORWIN & COMPANY

Dept. D.4.,

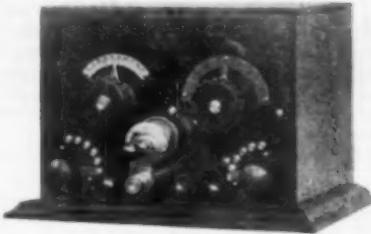
4 West Park Street, Newark, New Jersey



Reynrad Specialties

Superior Receiving Equipment.

The "Reynrad" RR-74 Multiwave Tuner and Audion Detector is an exceptionally fine receiving outfit mounted as a cabinet unit. It is as efficient at 200 meters as it is at 20,000 meters. When used in conjunction with the RA-72 Two Step amplifier, at our testing station, music and radiophone conversations have been heard from both coasts—an exceptional record. The amplifier positively does not howl or squeal.



RR-74 and RA-72

With the RCR-30 Crystal Detector receiving set, we have repeatedly copied ship stations 1500 miles, chiefly overland, and amateur stations over 1000 miles away. This record places the RCR-30 Receiving cabinet on a par with many audion detector sets.

Note the original and artistic design of these instruments.
 RR-74 Mu'tiwave Tuner & Detector, with bulb only. \$60.00
 RA-72 Two Step Amplifier, with Bulbs..... 55.00
 RCR-30 Crystal Receiving Set, with 3000 ohm phones. 30.00

REYNRAD SHORT WAVE COILS

Just what you have been looking for. Single lower inductances, wound on heavy 4" Bakelite tubes, with standard DeForest plugs. A set of three will bring in amateur stations as you never have heard them before. An additional secondary coil will make your receiving outfit equally efficient up to 600 meters. State wave length desired 175-300 or 300-600.

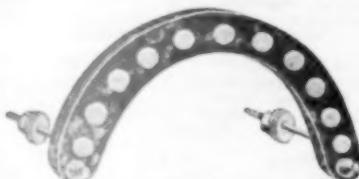
Reynrad Short Wave Coils..... \$2.00 each
 Standard DeForest Plugs for HC or DL coils..... .65 each

We carry a large stock of standard apparatus and supplies.

Acme, Murdock, Clapp-Eastham, Magnavox and DeForest Agents.
 6c in stamps will bring our catalogue and place your name on our mailing list.

CORRESPONDENCE SOLICITED

REYNOLDS RADIO SPECIALTY CO. 729 South Prospect St., Colorado Springs, Col.



Pat. Applied For.

REMLER No. 93 A-BATTERY POTENTIOMETER

Increases detector sensitiveness and signal audibility.

The plate voltage of any detector tube must be carefully adjusted for maximum sensitiveness and signal audibility. Potentiometer control provides close adjustment with ease of operation. This Remler Unit is not brittle and is connected across the A-Battery to control the plate potential over a six volt range by half-volt steps. Circuit diagram furnished with each unit.

No. 93—Remler A-Battery Potentiometer Unit only with studs for panel mounting .75c

No. 94—Remler Rotary Lever Switch for use with No. 93 Unit..... .45c

Complete 200 page catalogue will be sent upon receipt of 85c.

LEO J. MEYBERG CO.

Successors to Haller Cunningham Electric Co.
 428 Market St., San Francisco, Cal.

1/4 H. P., 110 volts,
 A. C., 60 cycle,
 single phase,
 1750 R. P. M.

MOTORS

LARGE QUANTITIES NEW WASHING MACHINE MOTORS

These are of standard manufacture and carry the full factory guarantee.
 Shipped in original boxes. Complete as cut. Suitable for operating Coffee
 Grinders, Ice Cream Separators, Bottle Washers, Air Compressors,
 Small Lathes, Etc.

Mail Order Wanted
 We will send C.O.D. subject to full examination.
 Money Back Guarantee.

\$22.75 Each

Manufacturers' Distributor
 GRAS. H. JOHNSTON - Box 19, W. E., Pittsburgh, Pa.

EXIDE STORAGE BATTERIES

Brand-New Stock

Assembled in neat box, with carrying strap. Charged ready for use, or dry sealed ready for your battery man to charge.

6 V. 35 AMP. HR. \$10.00—6 V. 70 AMP. HR. or 12 V. at 35 AMP. HR. \$19.00—6 V. 105 AMP. HR. or 18 V. at 35 AMP. HR. \$27.00—6 V. 140 AMP. HR. or 24 V. at 35 AMP. HR. \$36.00—6 V. 315 AMP. HR. or 12 V. at 162 AMP. HR. or 18 V. at 108 AMP. HR. or 24 V. at 81 AMP. HR. or 54 V. at 35 AMP. HR. \$81.00.

Seeing is believing, let us see if you are interested in an "A" Battery. Send your check or a letter, how can we do it. We are here to stay, and our guarantee goes with our products.

Detroit Radio Laboratories, Inc.
 Amateurs Co-Operative Radio Club of America.
 Join now Amateurs, save \$\$\$\$\$\$.

3661 Gratiot Ave., Detroit, Mich.

Second District Amateur Radio Convention - Exhibition

A Real Convention of Radio Amateurs and a
Real Exhibition of Amateur Radio Equipment

WILL BE HELD AT

The Pennsylvania Hotel-New York

MARCH 16 - 17 - 18 - 19

THERE have been automobile shows, marine shows, electrical shows, business shows, and what not, but this is going to be a real simon-pure amateur radio show, and the biggest thing yet done in the history of amateur radio.

There will be plenty of lectures and talks to give amateurs all the latest "dope," and actual demonstration of exhibited equipment of all kinds will give every radio man his chance to actually see and hear what all the latest types of apparatus will do in actual operation.

The glass-enclosed roof garden of the hotel will be the exhibit hall, and the adjoining Butterfly Room affords an excellent lecture hall, with adequate seating capacity. Only papers of vital interest to amateurs will be presented. Manufacturers who are exhibitors and who desire to describe their equipment will be included in this program.

The first three days will be devoted to business. The last day will be devoted to general sociability. A banquet for everybody, male and female, will be held on the night of the nineteenth. And it's going to be **SOME** banquet. This refers both to the dinner and what will be done and who will do it. All the big men of radio will be there.

THIS convention-exhibition is being held under the auspices of the Second District Executive Radio Council. It is non-partisan, non-sectarian, non-everything—just a straight out and out Second District Amateur Radio Affair, sponsored by all the radio clubs of the Second District.

There has never been such an opportunity for material gain, for acquiring knowledge, the making of personal acquaintances, and for general good, in this country before. It will be the biggest thing ever done in the history of amateur radio.

EXECUTIVE RADIO COUNCIL—Second District

COMMITTEE

J. O. SMITH, Chairman

J. DI BLASI

A. F. CLOUGH

C. G. TABER

C. J. GOETTE

R. H. McMANN

F. C. W. THIEDE

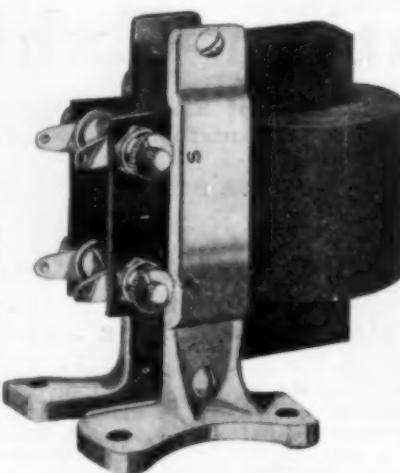
C. E. PEARCE

E. W. DANNALS

A-A

AMPLIFYING TRANSFORMERS—FAMOUS FOR
(AUDIO FREQUENCY)

EFFICIENCY—
THEY RETAIN
THE NATURAL
TONE



HIGHEST QUALITY
FIRST IN DEMAND

SOLD BY

Chicago Radio Laboratory,
Chicago, Ill.

Manhattan Electrical Supply
Co., Chicago.

High-Grade Wireless In-
strument Co., Asheville,
N. C.

MOUNDED AS
ILLUSTRATED

\$5.00

SEMI-
MOUNDED **\$4.50**

UNMOUNTED **\$4.00**

Shipments made from stock
prepaid.

Satisfaction Guaranteed or Money Refunded.

WE OFFER ATTRACTIVE PROPOSITIONS TO DEALERS AND MANUFACTURERS.

**ALL-AMERICAN ELECTRICAL MFRS., 815 Wisconsin Ave.,
OAK PARK, ILL.**

—ENGINEERS—MANUFACTURERS—

“PW” Has The Latest Radio Apparatus In Philadelphia

Come in and see Us—You do not have to Buy.

We have complete stock of parts for the Radiophone you are building.

Philadelphia School of Wireless Telegraphy

10th Floor, Parkway Building, Broad Street, Near Arch, Philadelphia

RADIO CLUB PINS



Special folder of designs and prices in
addition to regular school pin and ring
catalog free on request. Be sure to
see these new numbers which will put
new life in your club.

METAL ARTS CO.

Dept. 10,

Rochester, N. Y.



EVERYTHING RADIO

CATALOG FOR 5c IN STAMPS

Q-11221 Superior Ave., Cleveland, O.

NEW APPARATUS



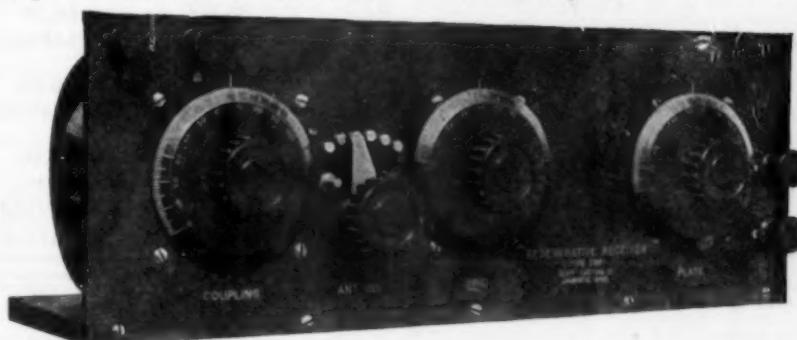
Type Z.R.V. Variometer has unit construction with bakelite shell and hard wood ball. Has low dielectric losses and a range of inductance of 1.25 mil henry maximum to .1 mil henry minimum. Is readily used on table or mounted on panels.

Complete with 3" dial and knob . . . \$6.50
Without dial or knob \$5.75
Variocoupler of same construction \$7.50



A combination of beauty and convenience. Detector panel has plug connection which takes your regular phone tips. One stage amplifier has binding posts for connecting two as a two stage amplifier. All binding posts on detector, amplifier and Regenerative set correspond for jumper connection.

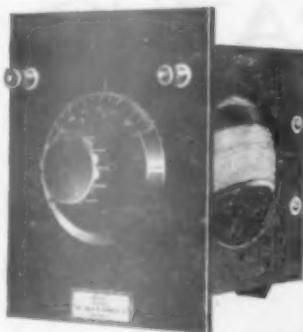
Tube Control Detector Panel, Z.R.D. \$12.00
One Stage Amplifier Panel, Z.R.A. \$18.00
Rheostat only \$1.20



Z.R.F. Regenerative Receiver consists of two Z.R.V. Variometers and a Coupler of similar construction, together with Grid Condenser and Grid Leak with Bakelite Panel machine engraved. Licensed under Armstrong U. S. Patent No. 1,113,149. This exactly matches our Tube Control and Amplifier panels with which it may be harmoniously used. Its range of wave length is 175 to 600 meters. Price . . . \$38.00

Co-operate with your local dealer by helping him to carry a stock of Clapp-Eastham Co. apparatus, famous for its reliability during 13 years of continuous manufacture. If he doesn't carry our instruments send 6c stamps for our complete catalogs.

CLAPP-EASTHAM CO., 114 Main St., Cambridge, Mass.



**KENNEDY
EQUIPMENT**



VARIOMETER AND VARIOCOUPLER

IN FULL KEEPING WITH THE HIGH QUALITY KENNEDY LINE

TYPE 909 VARIOMETER.....	\$8.50
Type 909 Variometer with special Kennedy commercial type bakelite knob with nickelized brass bushing and 3-inch bakelite dial.....	\$9.90
Type 905 Mounted unit as illustrated above	\$12.25

TYPE 919 VARIOCOUPLER.....	\$7.00
Type 919 VarioCoupler with special Kennedy commercial type bakelite knob with nickelized brass bushing and 3-inch bakelite dial.....	\$8.40
Type 915 Mounted unit as illustrated above	\$11.75

Send for Bulletin 901 for more complete description.

ABSOLUTELY AND UNCONDITIONALLY GUARANTEED TO GIVE
COMPLETE SATISFACTION

Sent POSTPAID on Receipt of Price if Your Dealer Can't Supply You.

**THE COLIN B. KENNEDY COMPANY
RIALTO BUILDING**

SAN FRANCISCO

10c. Charges Your Battery AT HOME WITH AN F-F Battery Booster

and your station will never be closed because of a discharged battery.



Is it not gratifying to feel that your filament battery will always be ready when you want it and that you will never have to give up in disgust when working a distant station? A fully charged battery is better, will last longer and everything dependent upon the battery will work better.

F-F Battery Boosters are automatic and operate unattended. Screw plug in lamp socket, snap clips on battery terminals and see the gravity come up. The ammeter shows you just the amount of current flowing. Adjustable carbon electrodes electrify the current and last for thousands of hours. Everything complete in one compact, self-contained unit.

The F-F Booster is a Magnetic Rectifier for 105-125 Volt 60 Cycle Alternating Current. Bantam Type 6 charges 6 V. Battery at 6 Amps. \$15 Type 16 charges 6 V. Battery at 8 Amps. \$24 Type 166 charges 6 V. Battery at 12 Amps. \$32

Also Boosters for 12 Volt Batteries.

Shipping Weight 10 and 15 lbs.

Order from your dealer or send check for prompt express shipment. If via P. Post have remittance include postage and insurance charges. Will also ship C.O.D. Also F-F Battery Boosters for charging batteries from Farm Lighting Plants and Direct Current Circuits.

Order now or write to-day for descriptive Bulletin No. 31

The France Mfg. Co. CLEVELAND, OHIO

AUDION CONTROL PANEL

Polished bakelite panel, size 4 x 6 1/2 in. mounted on brackets or can be mounted in cabinet. Equipped with rheostat, "B" battery control, grid leak, grid condenser, and standard socket for VT or Audion bulbs.

Price prepaid \$6.25

ONE STEP AMPLIFIER

Bakelite panel size 4 x 6 1/2 in.

Price prepaid \$12.50

TWO STEP AMPLIFIER

Bakelite panel size 6 x 8 in.

Price prepaid \$22.50

Illustrated literature, it's free, write.

**KEYSTONE RADIO COMPANY
DRAWER 307, GREENVILLE, PENN.**

BUILD YOUR OWN SET

High quality, seamless paper tubing, in just the right sizes for constructing

Variometer 3 1/8" x 2" 4 1/8" x 2 1/2" 25c

Vario-Coupler 3 1/8" x 2" 4 1/8" x 4 1/2" 35c

3500 Meter Loose Coupler 3 1/4" x 7" 3 7/8" x 7" 45c

6000 Meter Loose Coupler 3 1/4" x 7" 4 1/8" x 7" 65c

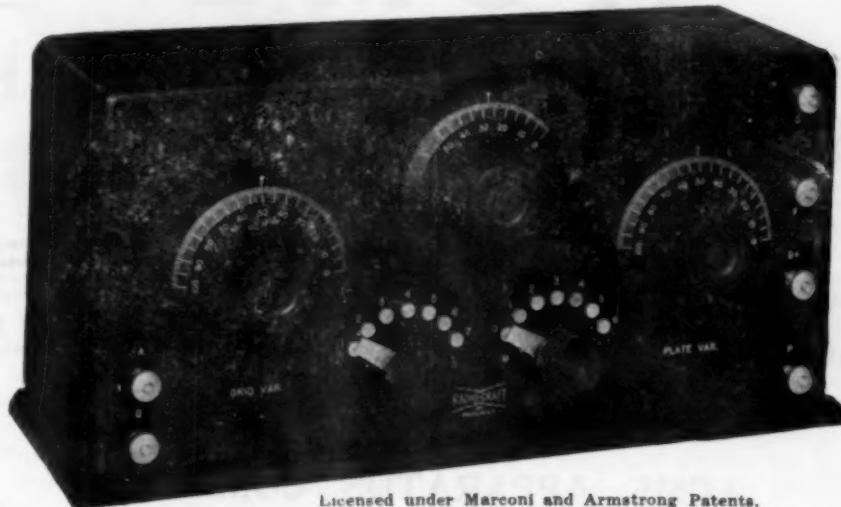
Postpaid to you—order to-day.

**THE TAYLOR COMPANY
Box 1043C**

Lowell, Mass.

RADIO-CRAFT PRODUCTS

PERFECTION IN RADIO INSTRUMENTS



Licensed under Marconi and Armstrong Patents.

Short wave regenerative receiving set with wave length range from 125 to 550 meters.

PRICE - - - \$65.00

FOR SALE BY

Atlantic Radio Co., Boston, Mass.
Continental Radio & Electric Corp., New York City
Freeman-Sweet Co., Chicago, Ill.
Howell Bros., Richmond, Va.
F. S. Katzenbach & Co., Trenton, N. J.
Manhattan Electrical Supply Co., New York City
McCarthy Bros. & Ford, Buffalo, N. Y.
Nevada Machinery & Electric Co., Reno, Nevada
Philadelphia School of Wireless Telegraphy, Phila., Pa.
Radio Distributing Co., Newark, N. J.
Rudolph Schmidt & Co., Rochester, N. Y.
Southwest Radio Supply Co., Dallas, Texas
Westchester Electrical Appliance Co., Yonkers, N. Y.
Jos. M. Zamoiski & Co., Baltimore, Md.



DETECTOR AND TWO-STAGE AMPLIFIER

Size:—8½" x 8½" x 4"
PRICE - - - \$70.00

RADIO-CRAFT CO., INC., Brooklyn, New York
Jobbers Inquiries Invited

ACME

ANTI-LIGHT BLINKER

The Acme Apparatus Company has devised a method for eliminating the blinking of lights when sending telegraph code with spark transformers.

This apparatus will help amateur radio by stopping the complaints from neighbors and power companies.

One-half Kilowatt \$5.00 One Kilowatt \$7.50

Both sizes equipped with 1-4 and 1-2 power steps

Write for bulletins.

ACME APPARATUS COMPANY

26 WINDSOR STREET,

CAMBRIDGE 39, MASS.

Transformer and Radio Engineers and Manufacturers

R
KLAUS
D
I
O
LOOP AERIALS

With the increasing use of Loops for local transmission, DX Reception, Static Elimination, Direction Finding, etc., every up-to-date station will eventually use one.

The Klaus Loop Antenna was designed especially for this work and it will "Deliver the Goods."

Furnished complete with instructions to operate and assemble, for

\$4.75

Postage Extra.

Reduction in Price on

Klaus Radio Storage Batteries

35 Ampere, 6 Volt (20.90)	\$15.00
45 Ampere, 6 Volt (26.00)	18.00

IMMEDIATE DELIVERIES

KLAUS RADIO CO.
EUREKA
ILL.

HEY !! 'BUGS'

Here's Something NEW. It's the GUSTAFSON VERNIER DIAL CONTROL. A neat little device and a necessity on every receiving outfit, gives a fine vernier or micrometer adjustment to your dials. NO CAPACITY EFFECT, rapid adjustment, cannot get out of order; can be applied to your present cabinet in two minutes. The vernier indicating dial is graduated in hundredths, giving very fine adjustment; long handles permitting adjustment without 'body effect'.

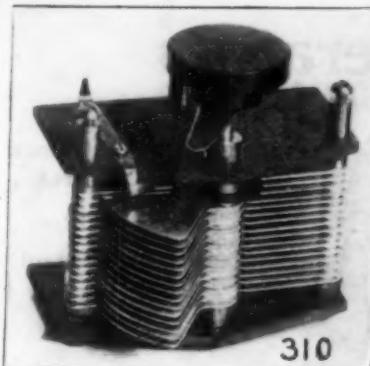
Everyone that sees it says: "It's the grandest thing I ever saw, don't see how I ever got along without it, and so simple, practical and neat; you ought to sell a million" AND WE WILL! at the price—

SPECIAL INTRODUCTORY OFFER
\$1.00 ea.—3 for \$2.50—\$9.00 a dozen
POSTPAID

Better get yours now, before we are swamped with orders. Orders strictly filled in rotation as received. We have a large supply, but they won't last long. Order yours NOW.

GUSTAFSON BROS.

Quality Apparatus
1402 N. HICKORY ST., JOLIET, ILL.
WATCH FOR THE BIG ANNOUNCEMENT !!!



Wireless Shop Variable Condensers Are Recognized as Quality Instruments

They are being used by several manufacturers of high grade equipment, by the Bureau of Standards, and by the AMATEUR who recognizes QUALITY, in all parts of this country as well as in several foreign lands.

Why Not Make the Condensers in Your New Set "WIRELESS SHOP VARIABLES?"

You can't go wrong, as they are fully guaranteed to give satisfaction, or we will cheerfully refund your money. What more could you ask. Ask some of the other fellows how they like their "Wireless Shop Variables".

The rugged construction of these condensers and the quality of workmanship will surely please you if you want, and expect to have, only the **BEST**. Made in two styles and eleven sizes. **EVERY DETAIL RIGHT**. Aluminum plates and spacers. FORMICA Insulation.

PRICES:

SERIES "T"

No. 20	2 plate Vernier.....	\$2.00
No. 70	7 plate .0001 m.f.....	2.35
No. 130	13 plate .0002 m.f.....	2.75
No. 170	17 plate .0003 m.f.....	3.15
No. 230	23 plate .0005 m.f.....	3.60
No. 310	31 plate .0007 m.f.....	4.30
No. 430	43 plate .001 m.f.....	5.25
No. 630	63 plate .0015 m.f.....	7.50

Include postage for 1 pound.

SERIES "L"

No. 2300	23 plate .00075.....	\$6.00
No. 4300	43 plate .0013	8.00
No. 6300	63 plate .002	10.00

Include postage for 2 pounds.

Prices include knob and pointer and mounting screws. Indicating dial furnished, instead of knob and pointer at 75 additional.

☛ WATCH OUR ADD NEXT MONTH FOR A NEW RADIO-PHONE AND "CW" VARIABLE ☛

The Wireless Shop

511 W. Washington St. A. J. Edgcomb.

Los Angeles, Cal.

Western dealers write to the Leo J. Meyberg Co., San Francisco, Cal., for sales proposition. You will find "Wireless Shop Variables" a profitable line.

ANNOUNCING "HiCo" SERVICE

You who have tried "HiCo" service know it means prompt shipments and guaranteed satisfaction.

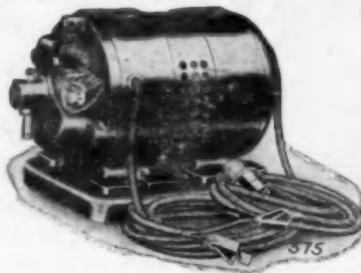
Formerly we confined ourselves to a very few lines, mainly our F-F Bantam Battery Booster at \$15.00. Now we are adding other well known instruments such as Benwood Gaps, Eldridge meters, Baldwin phones, Ame apparatus, Vacuum tubes, detectors, amplifiers and transmitting, etc., etc.

Send us your order for goods from the above lines. It will receive prompt shipment and be prepaid. Practically every order we receive is shipped within four hours.

HiCo, Box A268, Marion, Illinois

Motor-Generators

1750 RPM
UNIT PLANT
 Wick oiled.
 Manufactured and
 Guaranteed by
Robbins &
Myers Co.



Ward-Leonard
Type FM
Generator
field control
rheostats
\$16.00

- 100 W 500 V Unit for 110 V 60 cycle supply..... \$75.00
 Generator only \$42.00
- 200 W 500 V Unit for 110 V 60 cycle supply..... \$90.00
 Generator only \$50.00

We sell both small and medium sized DC and AC motors and generators.

Wireless Supply Company

Box 59,

Springfield,

OHIO

A Full Line of Radio Apparatus

We have everything you need. Below are a few items from our large stock. Watch this space for a complete stock list.

Panels

All DeForest Unit Panels..... DeForest Prices
 Bakelite
 Condensite
 Hard Rubber

Receiving Sets

DeForest Unit Crystal Receiver.....	\$47.35
DeForest Audion.....	76.15
DeForest T200.....	85.00
DeForest RS100.....	30.00
DeForest RS200.....	48.00

Receivers

Murdock 2000 ohm.....	\$4.50
Murdock 3000 ohm.....	5.50
Brandes Superior.....	7.00
Brandes Transatlantic.....	12.00
Brandes Navy.....	14.00
Baldwin Type C.....	16.50
Baldwin Type E.....	18.50
Baldwin Type F.....	21.00

Rectifiers

Westinghouse Rectigon \$18.00

Rheostats

Remler No. 81.....	\$1.75
Paragon.....	1.75
DeForest F200.....	1.00

The above prices are F.O.B. St. Paul.

PIONEER ELECTRIC CO.
 137 East Fifth St., St. Paul, Minn.

IMMEDIATE DELIVERY

on any standard make of Radio Apparatus.
 Chicago Distributors for:

Acme	DeForest
Amrad	John Firth
Brandes	Federal
Burgess	General Radio
Chelsea	Grebe
Clapp-Eastham	Murdock

Complete stock—when in a hurry for a certain piece of apparatus—"Give us your business—we'll give you SERVICE you will like".
 Send for free catalogs and bulletins, Blue Print of complete Radio Telephone for 10c.

Chicago Radio Apparatus Co.
 508 So. Dearborn St., Chicago, Ill.

STORAGE BATTERIES 80 Ampere Hour Capacity

The greatest little storage battery ever built. Twice as many plates and longer life than the ordinary battery. Neat, compact and portable.

Guaranteed 2 Years.

Price, F.O.B. Cleveland, \$17.50

Colebrook-Hamilton Battery Co.

1940 E. 82 St. 1941 E. 81 St.
 CLEVELAND, OHIO

MURDOCK

No. 55

The prices are
unusually low

2000
OHM
DOUBLE SET
\$4.50



The quality is
remarkably high

3000
OHM
DOUBLE SET
\$5.50

FOR YOUR OWN SATISFACTION

We urge you to TRY a set, that you may realize what sensitive, serviceable, real radio receivers can be obtained at "rock bottom" prices. WHAT YOU SAVE can be applied to the purchase of other apparatus—AND—you can be sure that your station will be the gainer in both WAYS. Ask your dealer for them.

BULLETIN NO. 20 NOW READY FOR
DISTRIBUTION. ASK FOR YOUR COPY.

WM. J. MURDOCK CO.

65 Carter St.,

CHELSEA, 50, MASS.

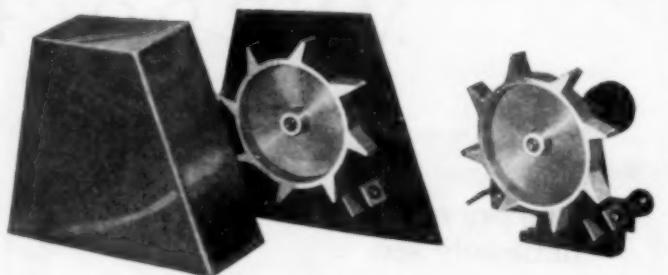
509 Mission St.,

San Francisco, Calif.

2500 MILES with a WILCOX Gap

and a 1 K.W. Acme Transformer — Actual input about 900 watts. Here's the gap 

DATE Jan 20 1921
RADIO BX 5
HEARD YOU CALLING OR
WORKING *R. J. G.* ON Jan 20
AT 8.870 ^{ON} 375 METERS.
AUDIBILITY *Very good*
TONE *High (very) 82*
REMARKS *Calling co dist. directly but very slowly*
RECEIVER AND DETECTOR USED
1 step and shot were received.
PLEASE CONFIRM DESCRIBING
YOUR APPARATUS
YOURS FOR BETTER AMATEUR
RADIO.
L. D. MEALER
RADIO MANAGER
WALNUT GROVE, CALIF.
ON SACRAMENTO RIVER



SPECIFICATIONS

ROTOR — Solid aluminum alloy casting pressed directly on to the shaft. Lathe turned inside and out and accurately balanced.

STATIONARY ELECTRODES —

Copper, easily adjustable and large enough to provide ample cooling.

BEARING — Tool steel shaft runs in bronze bearing $2\frac{1}{2}$ " long insuring long life and accurate alignment.

DRIVE — Optional, belt or direct connected. This gap requires less power than any similar one now on the market.

HOUSING — The enclosed type has a cast aluminum cover accurately machined to fit a bakelite panel which carries the stationary electrodes. This housing may be fitted to the open type gap at any time.

EFFICIENCY — We claim an efficiency for this gap second to none. It quenches well, has clear tone short leading spark and short leads.

ROTARY DISK like above but with bakelite center for mounting on motor shaft.

PRICE \$6.00 POSTPAID



OPEN TYPE
PRICE \$10.00 POSTPAID

Canadian Radio Experimenters Lateral Wound Coils.

URNS	APP. WAVE LENGTH	PRICE
25	130.375	\$0.55
40	225.575	.60
75	240.740	.70
100	460.1480	.80
175	750.2400	1.00
325	1375.4500	1.25
550	2250.7700	1.50
750	3000.11200	1.75
1200	6000.20000	2.50

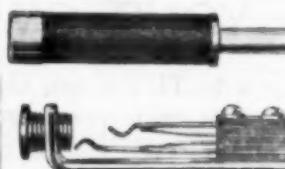
Special Sizes to Order.

Plugs & Bands with screws for coils..... \$0.75
Audio-Tron, two film..... 8.00
Audio-Tron C 300 four prong base..... 8.00
Audio-Tron C 301 Amplifier..... \$8.50
Radiotron U.V. 202 plate voltage 350 film,
current 2.35 amp. Transmitting Tube. 12.50
Vario-Couplers and Variometers..... 4.25

Send 5c for 20 page catalogue.

J. M. PAQUIN
THE ELECTRICAL SHOP
787 Queen St. W., Toronto, Ont.

RHAMSTINE ★ Radio Products



Can be used in any set. Indispensable in one and two step amplifiers. Eliminates binding posts and switches.

Circular on request. Attractive Dealer promotion.
J. THOS. RHAMSTINE ★ 2152 Larned St. E. DETROIT, MICH.

★ RADIO JACKS AND PLUGS

NEW ORLEANS RADIO APPARATUS AND SUPPLIES

ROSE RADIO SUPPLY 604 GRAVIER STREET NEW ORLEANS, LA.

Send 10c for Latest Catalogue

R T A

DE FOREST

**Any Amateur Can Talk 30 Miles by Wireless Telephone
With this New Midget.**



"Radiophone"★ Transmitter

(TYPE OT-3)

Aerial Oscillating Circuit Panel (Shown at Left)

Contains aerial oscillating circuit and all necessary controls, and the transfer key switch. Note clamps for fastening both panels together.

Price for this Panel—\$55.00

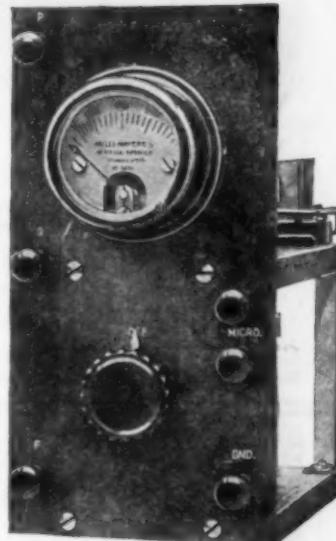
Power

Tube Panel (Shown at Right)

Contains tubes, Ammeter and filament rheostat. Both panels of Bakelite, well made and nicely finished.

Price for this Panel—\$45.00

* "Radiophone"
name copyrighted.



HERE is the most remarkable radio telephone for its size ever made. Complete in every detail. Works on any source of direct or alternating current, applying up to 500 volts. Tuning done by tapped switches. Only one 6-volt storage battery required; for filament, microphone and "B" Battery. Rectifier or Motor Generator supply may be used. Tests show a 30 mile telephone range; even greater distances can be covered under average amateur conditions.

Set consists of two separate panels, each 4 1/8" x 9", which can be clamped together to form one unit. Panels are described above. All metal parts nickel, wire covered with superfibre tubing, best materials and workmanship thruout. Prices listed are without tubes, microphone or power supply.

Find out about this newest DeForest production. Order at once to assure early delivery, either thru your regular dealer or direct from us.

DeForest Radio Telephone & Telegraph Company

Inventors and Manufacturers of High Grade Radio Apparatus

1407 Sedgwick Avenue

New York City

DE FOREST

A BUSINESS OPPORTUNITY.

A business making radio apparatus which has sold readily to some of the largest dealers in the country seeks a responsible and active selling agency.

The plant of the advertiser is so equipped that it can turn out a product that stands a high test and at the same time meets all competition.

We seek this selling agency for these reasons:—

- 1st. We want an effective sale throughout the country instead of to a limited number of large users.
- 2nd. Our business is young and our own efforts are best utilized in manufacturing.
- 3rd. We want an assurance through our selling agency that, if given the product, our own financial worries will be considerably modified.

Radio is the big thing for the next few years. There are now over 100,000 active private stations in this country.

Address Box A, Care QST Magazine, 61 Waverly Bldg., Hartford, Conn.



CHELSEA BAKELITE DIAL No. 41.

The Chelsea dials are made of genuine bakelite, beautifully finished, and bear a 100 division semi-circular scale. This scale is of white characters and so constructed as to be both deep-set and sharply defined. These divisions and characters are permanent and will neither wear off nor fall out.

The dial is $3\frac{1}{4}$ " in diameter, $\frac{3}{4}$ " thick, with a long, sloping easily read marking. The edge is sharp and permits accurate settings to be made. The knob also is of bakelite $1\frac{3}{4}$ " in diameter, with a fine, straight knurled edge, which greatly aids the making of fine adjustments. These two parts are permanently fastened together by a long brass bushing which also serves to carry the set screw for attaching to the instrument shaft, and more important to give perfect alignment in use. *Chelsea bakelite dials run true, and will not warp.*

Dials only, without knob and bushing, are furnished with our well known elongated hole, and may be placed upon any of our unmounted condensers now in service.

The complete dial and knob is made to fit either $\frac{1}{2}$ " or $\frac{1}{4}$ " shaft. Specify size when ordering, otherwise the $\frac{1}{4}$ " hole will be furnished.

Panels equipped with our circular dials are both easier to operate and more attractive. Chelsea dials are beautiful in appearance, low in price, accurate and durable in service, unexcelled by any, at any price.

Dial only \$0.75

Dial and knob complete \$1.00

Purchase from your dealer.

BULLETIN SENT UPON REQUEST.

Chelsea Radio Company,
Manufacturers of Radio Apparatus.

15 Fifth Street,

Chelsea, Mass.
Moulder of Bakelite.



Another New Book for Radio Men PRACTICAL AMATEUR WIRELESS STATIONS

Compiled By J. Andrew White, Editor THE WIRELESS AGE.

An "Experience Book" containing the best suggestions of thirty-three experimenters on Building, Installing, and Operating Experimental Stations for Radio Communication.

A Few of the Contributors are

Gordon Lathrop; J. A. Weaver; J. E. Law, Jr.; E. T. Jones; Francis R. Pray; J. Scott Taggart; A. A. Kluge; Morton W. Sterns; Dr. Thos. W. Benson; Frank J. Bremer; Ralph Batcher.

Special 30 Day Introductory Offer

PRACTICAL AMATEUR WIRELESS STATIONS and One Year's Subscription to The WIRELESS AGE \$2.75 Reg. Price \$3.25

(Postage outside U.S., 50c extra.)

WIRELESS PRESS, INC., 328 Broadway, New York

Send for Our
New Catalog.

Introductory
Price
75c
Paper. 136 Pages
Profusely
Illustrated

CANADIAN AMATEURS
Deal in Canada and Save \$ \$ \$ \$
The Leading Amateur Supply House for
WIRELESS
Apparatus and Parts.
Send 5 cents for our list.
THE VIMY SUPPLY CO.
567 COLLEGE ST., TORONTO



PATENT-SENSE
"The Book for Inventors & Mfrs."
By Return Mail FREE. Write
LACEY & LACEY, Dept. 95 Washington, D.C.

Best of Everything in
Radio Apparatus and Parts.
Send Stamp for Catalog "Q"
J. H. BUNNELL & CO.
32 Park Place, New York

Quality WEACO Service
VT Sockets—\$0.90, \$1.00, \$1.20, \$1.50, \$1.75. New
Radiotrons, \$5.00. Electron Relays, \$6.00. Signal
Navy Type Reg. Receiver, \$37.50. 6 V. 60-80
amp. storage battery, guaranteed 2 years, \$20.00.

WESTCHESTER RADIO SERVICE
253 So. BROADWAY. YONKERS, N. Y.

"EVERYTHING IN RADIO"
WESTERN RADIO ELECTRIC COMPANY
SEND FOR OUR MARCH
STOCK BULLETIN AND PRICE LIST

550 South Flower Street,

Los Angeles, Cal.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

You Have Been Looking For A
Really Good Microphone
FOR YOUR RADIOPHONE

Here It Is.—Built For Your **EVERY PURPOSE** AND
It Will **GIVE** You **RESULTS** That Will **SATISFY**



No. 260-W

Hand Microphone

A handsome and very
practical instrument.

Price - - \$7.00

Shipping weight 2 lbs.



No. 261-W

Desk Microphone

An excellent instru-
ment for desk use.

Price - - \$6.50

Shipping weight 3 lbs.



No. 262-W
For panel
mounting.
Adjustable
pony arm.

Price - - \$5.25

Shipping weight 2 lbs.



No. 263-W
For panel
mounting.
Full nickel
plated.

Price - - \$5.25

Shipping weight 2 lbs.

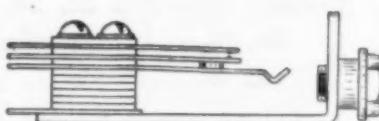
The 260-W and 261-W are fitted with 6' cords.
Fitted with No. 1428-W plug, \$2.00 extra.

The 262-W and 263-W are fitted with connecting cords.

Automatic Filament Control Circuit
(PAT APPL'D FOR)

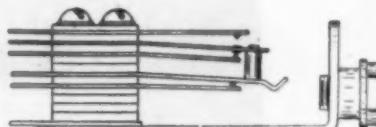
USING FILAMENT CONTROL JACKS

A REAL STEP IN ADVANCE



No. 1435-W

PRICE - - \$1.20 Each



No. 1438-W

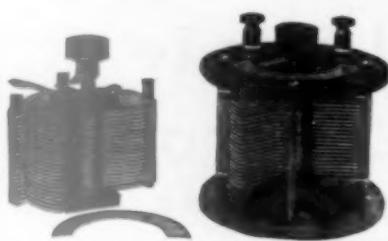
PRICE - - \$1.50 Each

Ask your dealer for them—if he does not have them tell us his name or write direct.

FEDERAL TELEPHONE AND TELEGRAPH CO.

BUFFALO, N. Y.

“Federal” Radio Accessories Are The Standard



THE "ILLINOIS" VARIABLE CONDENSER

The Condenser with "Star Spring" Tension

MADE RIGHT - STAYS RIGHT

Hard Rolled Aluminum Plates

These condensers are made by a watch mechanic schooled in accurate workmanship and who can't get over the habit of critical inspection.

Three Styles: No. 1. Panel; No. 2. Open Type as shown; No. 3. Fully Encased. Anti Profiteer. Less than pre-war prices. Fully assembled and tested.

Style No. 1 No. 2 No. 3
 97 Plates 87.00 \$ 8.00
 48 " 3.50 4.50 4.75
 38 " 2.75 3.75 4.00
 18 " 2.25 3.25 3.50

With Style No. 1, we will, if desired, furnish 3 inch Dial with large knob, instead of Scale and Pointer.

Extra Price 75 cents.

Sent Prepaid on Receipt of Price.

Except: Pacific States, Alaska, Hawaii, Philippines and Canal Zone, add 10c. Canada add 25c.

Foreign Orders other than Canada not solicited.

Kindly note: We issue no Catalog, and make no "trade discounts". We set our prices at the lowest limit, and leave the "middle man" out for the sole benefit of the "consumer".

G. F. JOHNSON, 625 Black Ave., Springfield, Ill.



BATTERIES FOR PLATE
CIRCUIT OF VACUUM TUBES.

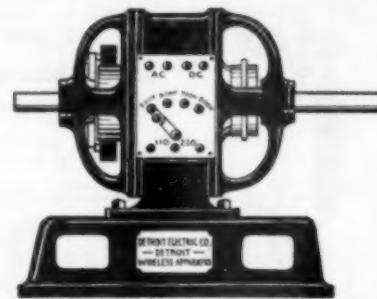
NOVO MANUFACTURING CO.
424 W. 33d ST. 531 So. Dearborn St.
NEW YORK CHICAGO

SYNCHRO-GENERATOR SINGLE UNIT CONVERTERS TRANSFORMER IN BASE

FOR VARIABLE VOLTAGE
500 TO 800 VOLTS 1000 TO 1500 VOLTS
250 WATTS

For C. W. and SYNCHRONOUS DAMPT.

Prices and Bulletin on Application.
POWER TUBES—AMPLIFIERS—DETECTORS
GREBE—ACME—TUSKA—FEDERAL—
BENWOOD—CHELSEA—MURDOCK—Etc.



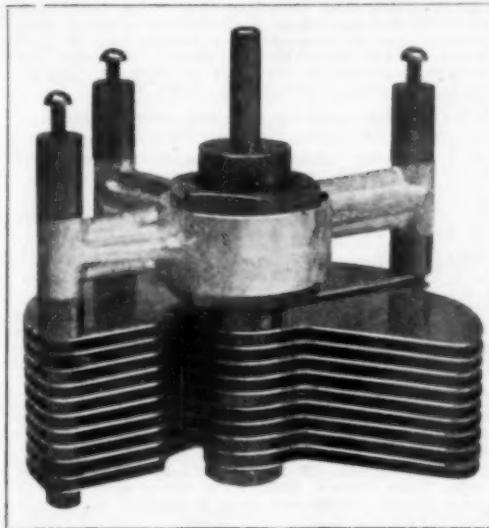
DETROIT ELECTRIC COMPANY
434 SHELBY ST., DETROIT, MICH.

Attention Amateurs

G. E. Detector Tubes.....	\$5.00
A. P. Electron Relays.....	6.00
7 Strand Copper Wire, C. ft.	1.25
7 Strand Copper Wire, per 1000 ft.....	10.00
Enamel Wire No. 22, 24, 26, 28 on 1 lb. spools, per lb.....	1.00
Also DeForest, Acme, Amrad, Radiocraft Products.	

The Quaker Light Supply Co.

728 Arch St., Philadelphia, Pa.
Attention of Mr. H. J. Dunbar.



THE CONDENSER WITH A BACKBONE

Our new variable air condenser (.0007 M.F.) is ready for the market—for you. It is built—not assembled—with a rigid aluminum casting for a foundation. The plates are of .032 half hard aluminum sheet. The entering edge of the rotary plates is rounded off so that the calibration curve is practically straight. This condenser has but one bearing, of spring controlled double-cone type, which insures smooth, uniform rotation and also automatically takes care of any wear. This condenser can be mounted in either horizontal or vertical position.

Price Unmounted as shown.....\$5.00

We also have in stock for immediate shipment 20/38 S.C.C. Litz.

Price per 100 ft.....\$0.40

The above articles shipped postpaid upon receipt of remittance. To avoid delay or possible loss, remit by Postal Money Order.

COTO-COIL CO. 87 WILLARD AVE.,
PROVIDENCE, R. I.

CLASSIFIED ADVERTISEMENTS

Five cents per word per insertion, in advance. Name and address must be counted. Copy must be received by the 10th of month for succeeding month's issue.

TELEGRAPHY—(both Morse and Wireless) and Rail-way Accounting taught quickly. Tremendous demand. Big salaries. Great opportunities. Oldest and largest school; established 45 years. All expenses low—can earn large part. Catalog free. Dodge's Institute, R St., Valparaiso, Indiana.

RADIO PHONISTS ATTENTION: High voltage generators. We supply motor generator units in various capacities especially designed for radio phone work. Low powered rotary converters, dynamotors, fractional H.P. motors, storage batteries. Various types of meters, condensers, navy type 4" nickel plated brass engraved dials, spark gap rotors, SYNCHRONOUS SPARK GAPS. RAY-DI-CO RADIO PHONE sets furnished knocked down ready for assembling and your connection. Get acquainted with our SERVICE. RAY-DI-CO, 2653D, N. Clark St., Chicago, Ill.

AUTO MOTORS SUPPLIES: Buick, Michigan, Stoddard-Dayton, E.M.F., Cadillac, Overland, Continental and Buda Motors. All types \$50 each and up. Special High Tension Magnets 2 and 4 cylinder \$9.50 each. Electric & Gas Head Lamps, Coils, Carburetors, Air Compressors, Generators, Starters, etc. Write for Catalog. Address Motor Sales, Dept. 19, West End, Pittsburgh, Penna.

FOR SALE—Murdock transmitting set, \$3.50. C. D. Gould, 45 Mason St., Rockland, Maine.

FOR SALE—Complete equipment station 9ZQ. Includes United Wireless 1 KW transformer, glass plate oil immersed condenser for same, C.R.L. Paragon, Hyrad 230 cycle gap, especially made OT for 250 and 375 meter transmission with 2" ribbon on primary. Wireless Specialty two step amplifier, United Wireless loading inductance, aerial switch, insulators, detector panel, storage battery, etc. Write for list, all communications answered and every article guaranteed to be a bargain. G. R. Hammond, Oelwein, Iowa.

FOR SALE—SCF's spark transmitter. Transformer \$30; Gap \$12; Motor \$22; Condenser \$15; Oscillation Transformer \$10; H.W.A., \$7; Regenerative Set 175 to 1200 Meters \$20. Particulars on request. Sidney Lohmann, 8WI, Greenville, Ohio.

FOR SALE—Clapp-Eastham Co. Semi-Quenched rotating spark gap, with variable speed motor, \$30.00; Blitzn Rad'coupler O.T. \$8.00; Benwood spark gap, without motor \$18.00; Thordarson 1 KW. type "R" transformer \$25.00; Murdock transmitting key \$3.00. R. E. Brigham, Jeweler, Oneonta, N. Y.

FOR SALE—1/2 KW Thordarson Transformer \$17.00. Audion Control Cabinet \$10.00, 6-60 Storage Battery \$12.00. All in perfect condition. Charles R. Jarosiewicz, 1330 W. 50th St., Chicago.

SELL: S.W. Regenerative Receiver, \$35.00; 2 h.p. 550 V. D.C. Motor, \$50.00; C.W. Set, \$45.00. Edward Webb, 117 E. Main, New London, O.

STOP! Look! and Think! 5 to 33% discount on all new standard rad'o receiving sets, radiophone and accessories. "Remember us!" The Kehler Radio Laboratories, Dept. 3, Abilene, Kansas.

DeForest Audion-Ultraudion Panel P500. Guaranteed perfect condition \$18.00. John Kavanagh, 1920 Anthony Ave., New York City.

FIRST twenty-eight dollars takes my Type R Thordarson Transformer. Brand new guaranteed perfect condition or money refunded. William Arnold, Southbridge, Mass.

RADIO PHONISTS ATTENTION. Money refunded if this Phone Set does not work. Here is a phone set that costs only seventeen dollars and forty cents to construct and when the Auditon sold by The Kehler Radio Laboratories, whose ad appears on the pages of this magazine, is used in conjunction with this circuit will transmit 15 miles. "B" Batteries are used, and results guaranteed. Enclose One Dollar for Blue Print and directions. H. D. Selvage, 1096 Clinton Ave., Dept. R, Irvington, N. J.

6,000 MILES ON A SINGLE BULB. 175 to 20,000 meters. Simple diagram of a complete short and long wave receiver, both arc and spark, with which we read Honolulu 6,000 miles, Germany 4,000 miles, San Diego, British Stations and hosts of others with a single bulb. Especially good on amateur wave lengths and all spark stations. Also telephone and music. Diagram and instructions mailed for 50 cents in stamps. Virginia Novelty Company, Martinsburg, West Va.

WANTED—One burnt-out 250-watt power tube. R. S. Miner, 68 Quaker Lane, West Hartford, Conn.

RADIO receiving apparatus for sale. Stamp brings list and prices. Bryce Ballinger, Miami, Oklahoma.

FOR SALE: 1 KW Thor Type R, \$30. Regen. Receiver, \$20. 1/6 H.P. Motor, \$20. All good condition. I. A. Nerber, 41 Beattie Ave., Lockport, N. Y.

BARGAIN: Remier VT or Audiotron Panel, \$12.00; Signal Navy Coupler, \$18.00 Wilfred P. Ching, Somerset, Pa.

ATTENTION:—Because I am now using J-Ray Gap have two Benwoods for sale, \$22.50 each. Also ten Murdock transmitting condensers at \$2.50. Blitzn loose coupler 200-2500 meters \$10. This apparatus formerly used by George Weber, 9JQ, 5579 Chamberlain Ave., St. Louis, Mo.

FOR SALE: Grebe non-synchronous rotary—good condition, sell \$31. Ship anywhere. Morris Press, University Heights, New York.

FOR SALE—Grebe CR-2, \$35; VT-1, \$7; VT-2, \$8. Brandes Navy Phones, \$10. First money order gets it. Charles Mason, 25 Winant Ave., Ridgefield Park, N. J.

OMNIGRAPH—5 dial, A-1 condition. Small buzzer attached, \$15. W. D. Olsen, 330 S-15, Corvallis, Ore.

FOR SALE: 1/2 H.P. 1750 Induction motor; Dubilier Condenser. Write 4CK.

FOR SALE—1 KW Transformer \$25. Or will exchange for 1/2 KW. Thordarson or other apparatus. W. S. Willis, 347 West 14 Street, New York City.

FOR SALE:—Receiving and transmitting apparatus. Owen Barton, Conneaut, Ohio.

FOR SALE: 1/2 K.W. Acme transformer dressed \$22. Cosradic O.T. \$12. Rotary gap motor \$7. 1/2 K.W. Signal condenser \$12. Jr. Crosby, 2606 E. Superior St., Duluth, Minn.

BARGAIN—Selling out. 1 KW. 25,000 volt Thordarson \$25; Hyrad rotary \$18; plate glass oil condenser \$15; or complete set with L.D. record \$65. Barrett, 222 N. Dunn St., Bloomington, Indiana.

FOR SALE: One Amrad quenched gap 1/2 K.W. never been used, \$19. T. B. Betterton, 1027 E. 10th St., Chattanooga, Tenn.

POWER TUBES—I have a few to spare, of various styles and sizes. K. B. Warner, Care QST.

BARGAIN:—1/2 K.W. Acme transformer; Murdock rotary gap complete; three Murdock transmitting condensers; all for \$30. Charles Wyzanski, Brookline, Mass.

AMATEURS—Correspondence solicited for purpose of giving advice and help in operating or purchasing wireless telegraph or telephone sets. Thomas A. Reid, SIV, 1219 N. Limestone St., Springfield, Ohio.

SPECIAL GARAGE MOTORS—New; Manufactured by General Electric Co. 1/4 H.P. \$22.75—1 H.P. \$88.50—2 H.P. \$126.50—3 H.P. \$146.50—5 H.P. \$188.50. All sizes both single and Polyphase Motors for immediate delivery. Special Charging Generators all voltages. Write for Catalog. Motor Sales, Dept. 19, West End, Pittsburgh, Penna.

FOR SALE:—Markusen B. storage battery, 40 volts, brand new, complete instructions, \$8.50. Stamp for list. E. G. Baier, 253 Ninth St., Brooklyn, N. Y.

FOR SALE: CW transmitter. Good for 10 miles. 110 volts AC or DC plate, \$20.00. Bridges, 1625 Tower Ave., Superior, Wis.

FOR SALE: CW units, variocouplers, \$6.00; Variometers, \$5.00; Oak cabinets all sizes, with or without bakelite panels; VT control units, series parallel panel switch, 50c; variocouplers are bakelite construction. Meade Bakelite and Radio Apparatus, 975 Putnam Ave., Brooklyn, N. Y.

FOR SALE: 2 DF's spark set, Installed Radiophone. 1 KW. Thordarson Transformer, General Radio 0-5 Radiation Meter, Dubilier Condenser 24,000 volt .007, Oscillation Transformer. Semi Quenched Noiseless Rotary with R & M Induction Motor, Key, etc. Will sell separately—All letters answered. H. G. Silbersdorff, 641 Pavonia Ave., Jersey City, N. J.

ARC INSTRUCTION

In order that prospective students for training as radio operators may keep posted regarding ARC instruction, we suggest a study of the following facts:

1. There are no questions on ARC transmitters on the present examination.
2. It is common knowledge that there is an anticipated and welcomed change in the examination questions for commercial licenses of all grades.
3. Examinations are split up into groups.
Receiving counts 20; transmitting 20; experience 20; diagram 10; storage batteries 10; laws 10; motors and generators 10. Total 100 points.
4. ARC questions will be included in transmitting, the total credit for ten questions correctly answered being 20 points, or 2 points per question. There will probably be but two questions on ARCS. counting only four points out of a total of one hundred.
5. Possibly one question on undamped reception counting two points will also be included in the ten on receiving.

We are prepared to train men on ARC and SPARK theory and practice. ARC instruction, however, will not be included in the present regular course until it becomes necessary for such knowledge in order to pass an examination, thus permitting a student to complete his course in the shortest possible time and begin receiving a salary.

MASSACHUSETTS RADIO & TELEGRAPH SCHOOL.

18 Boylston St., (cor. Wash.)

R. F. TROP

Boston, Mass.

G. R. ENTWISTLE

Tel. Beach 7168

"Hytone"

BUZZERS

for radio work. External tone adjustments. Pure silver contacts.

Price 60c postpaid

AJAX ELECTRIC CO.

Palmer St.,

Cambridge, Mass.

TELEGRAPHY

(Both Morse and Wireless and RAILWAY ACCOUNTING taught thoroughly and quickly. Big salaries now paid. Great opportunities for advancement. Oldest and largest school; established 45 years. Endorsed by Telegraph, Railway, Radio, and Government officials. Expenses low—opportunities to earn large portion. Catalog free.

EDDIE'S INSTITUTE

Street, Valparaiso, Ind.

Birad Tinned 7x22 Aerial Cable.... \$12.00 Per M.
Switch Points N.P. 3/16 x 3/16 x 3/8".... 35c Doz.
Acme Amp. Trans. A.2 Semi Mtd. \$5.00
Federal Jacks 2 Ckt.... \$1.00; 1 Ckt.... 70c Ea.
Federal Silver Plated Plugs.... \$2.50 Ea.

Other Makes of Apparatus Handled.

Blue Island Radio Mfg. Co.

597 Ann Street,

Blue Island, Ill.

USED APPARATUS

Bought, Sold and Exchanged.
We also carry a line of New Apparatus, Supplies,
Highly tested Transformer and Condenser Oil.
Rebuilt Storage Batteries.

Send for list of used Apparatus.

Meteor Electric Co.

Radio 6ABG

309 So. Flower St., Los Angeles, Calif.

JUST OFF THE PRESS RADIO TELEPHONE

Simple description of the Radio Telephone with complete circuits of a Transmitter, Receiver and Amplifier. With this data anyone can construct a Radio Telephone capable of talking fifty miles. The Amplifier used with a loud speaker intensifies the voice very clearly. 25 cents postpaid.

FOREST PUBLISHING CO.

No. 19 Myrtle Street,

Boston, Mass.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

NEXT QST:

The winning article in our contest

"THE IDEAL RELAY SPARK TRANSMITTER"

DON'T MISS IT!



A MAGAZINE DEVOTED
TO AMATEUR WIRELESS

Official Organ: American Radio Relay League

New Developments, C.W. Transmission,
Vacuum Tube Circuits, Regenerative
Receivers, Underground and Loop
Antennas, Radiotelephony, Relying,
Operating Department Work, all
A.R.R.L. News, Humorous Stories by
The Old Man. All these and many
more are included in QST.

SPECIAL TRIAL OFFER

Regular price \$2.00 per year, 20 cents
per copy. Introductory rate: 7 months
subscription for \$1 and attach coupon.

PIN A DOLLAR BILL TO COUPON
AND MAIL IT TODAY!

RETURN COUPON

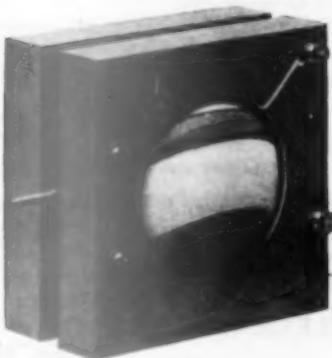
American Radio Relay League,
Hartford, Conn.

Enclosed find \$1; please enter my trial subscription to QST for 7 months.

Name _____

Address _____

SPECIAL!



VARIOMETER



VARIO-COUPLER

Your opportunity to build that short wave regenerative receiver is now at hand, and you can use the best Variometers and Vario-coupler on the market today! And you can purchase these at a price that will fit your pocketbook.

For a **LIMITED** time only the following prices will apply on **RADIO SHOP** Variometers and Vario-couplers.

"RADIO SHOP" Variometer

Regular Price \$10.00

SPECIAL PRICE \$5.75

"RADIO SHOP" Vario-coupler

Regular Price \$8.00

SPECIAL PRICE \$4.75

The quality is the same and both of these products carry our "money back if not satisfied" guarantee.

Don't forget that this offer is only for a short period. **SEND IN YOUR ORDER NOW** before our present stock is exhausted. Only two Variometers and one Vario-coupler sold to an individual.

Sufficient postage must be included otherwise sent express.

ADVANCE BULLETIN

EVERYONE

who is interested in **SHORT** wave radio communication and **C.W.** work **KNOWS** that **Radio Shop** receivers are "delivering the goods."

Until recently we have devoted our energies exclusively to short wave products, but now our manufacturing facilities are such that we may offer to the field the latest **RADIO SHOP** development for those who are interested in long wave reception, **THE RADIO SHOP LONG WAVE RECEIVER**.

This set not only includes the tuning inductances and capacities, but also a standard **Radio Shop** Audion control unit. The general appearance, and workmanship is identical with our Short Wave Receiver and embodies features that will appeal to the most discriminating. Circuits are so synchronized that practically the entire range of wave lengths are covered with two controls, eliminating the troublesome "hard-to-find" condition which is encountered in almost all long wave receivers now on the market. With this receiver it is unnecessary to experiment for weeks before results are obtained. It works from the start and keeps right on working under all conditions. You can always find your station, and always at the same adjustment. This is on account of the arrangement of controls which entirely eliminates undesirable combinations. The wave length range is from 1,000 to 25,000 meters and stably oscillates over the entire range. Practically all European high power stations have been copied at our plant at San Jose on an antenna thirty feet high and fifty feet long. This was **WITHOUT** any steps of amplification.

The price of **THE RADIO SHOP Long Wave Receiver**, complete with Audion Control in same cabinet, is **Seventy-five Dollars**.

Descriptive matter on this receiver will be off the press shortly. Write for your copy now.

"RADIO SHOP" PRODUCTS ARE LABELED AS SUCH. DO NOT ACCEPT ANY APPARATUS THAT DOES NOT BEAR THE "RADIO SHOP" LABEL AND YOU WILL BE ASSURED OF UTMOST SATISFACTION AND RESULTS.

All **RADIO SHOP** products are sold with our "money back, if not satisfied" guarantee which we feel is our best assurance of value and satisfaction.

THE RADIO SHOP

SAN JOSE,

Dept. Q.

CALIFORNIA

—FOR YOUR CONVENIENCE—

QST'S INDEX OF ADVERTISERS IN THIS ISSUE

Acme Apparatus Co.	106	Magnavox Co., The	66
Ajax Electric Co.	117	Manhattan Elec'l Supply Co., Inc.	82
All-American Electrical Mfrs.	102	Massachusetts Radio & Tel. School	117
American Electro Technical App. Co.	65	Metal Arts Co.	102
American Radio & Research Corp.	Fourth Cover	Meteor Electric Co.	117
American Radio Sales & Service Co.	80	Meyberg Co., Leo J.	100
Atlantic Radio Co.	Second Cover	Midwest Radio Co.	82
Atlantic Radio Supplies Co.	91	Murdock Co., Wm. J.	109
Audiotron Mfg. Co.	69	Mutual Purchasers Assn.	71
Bates, Lee A.	82		
Benwood Co., Inc., The	78		
Blue Island Rdo. Mfg. Co.	117		
Brenda, C. Inc.	66		
Bunnell & Co., J. H.	112		
Burgess Battery Co.	74		
California Elec. Supply Co.	96		
Chelsea Radio Co.	76-112		
Chicago Radio Apparatus Co.	108		
Chicago Radio Laboratory	67		
Clapp-Eastham Co.	103		
Colby's Telegraph School	76		
Colebrook-Hamilton Battery Co.	108		
Connecticut Tel. & Elec. Co.	Third Cover		
Continental Radio & Elec. Corpn.	60-61		
Corwin & Co., A. H.	99		
Coto-Coil Co.	115		
Cramer & Swain Radio Corp.	65		
DeForest Radio Tel. & Tel. Co.	111		
Detroit Electric Co.	114		
Detroit Radio Laboratories, Inc.	100		
Dodge's Institute	117		
Doolittle Co., F. M.	76		
Doubleday-Hill Electric Co.	78		
Duck Co., The Wm. B.	72		
Eastern Radio Co., The	90		
Eastern Radio Institute	89		
Eastern Radio Laboratory	78		
Evansville Radio Laboratory	74		
Electrical Specialty Co.	93		
Electric Machine Co., The	98		
Executive Radio Council, 2d Dist.	101		
Experimenters Information Service	95		
Federal Tel. & Tel. Co.	113		
Firth & Co., John	81		
Forest Pub. Co.	117		
France Mfg. Co., The	104		
General Radio Co.	94		
Grebe & Co., A. H.	88		
Gustafson Bros.	106		
Haake, Arthur	86		
HiCo	107		
J-Ray Mfg. Co.	85		
Johnston, Chas. H.	100		
Johnson, G. F.	114		
Karlowa Radio Corpn., The	90		
Kelly & Phillips	98		
Kennedy Co., The Colin B.	104		
Keystone Radio Co.	104		
Keystone Wire Co.	96		
Killoch Co., David	80		
Klaus Radio Co.	106		
Koch, John R.	92		
Lacey & Lacey	112		
Liberty Radio Parts Co.	102		
Westchester Radio Service	112		
Western Radio Electric Co.	112		
Whittall Electric Co.	88		
Wilcox Laboratories, Inc., The	110		
Wireless Improvement Co.	94		
Wireless Press, Inc.	112		
Wireless Mfg. Co.	74		
Wireless Shop, The	107		
Wireless Supply Co.	108		

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

Now Ready—Power Tubes

U.V.
202



Postpaid

PRICE
\$8

In Tuska Stock--Limited Number

For Immediate
Delivery

THE NEW U.V. 202 RADIO CORPORATION OF AMERICA 5 WATT TRANSMITTING TUBE HAS GIVEN OUTPUT AS HIGH AS 20 WATTS.

A Transmitting Tube of Merit

Specifications:

Filament Current 2-35 A.
Filament Voltage 7.5 V.
Normal Life, 250 Hours

Plate Current 50 M.A.
Plate Voltage 350-400 V.
Rated Output 5-100 Watts

Immediate delivery now—delay later. Use the order blank and mail with remittance today, and we will ship by return mail until supply exhausted.

See Tuska C.W. Equipment at your Dealer's.

* Name _____

Address _____

Send _____ U.V. 202 Transmitting Tubes for \$ _____ enclosed.

The C. D. Tuska Co.

Hartford, Conn.

CONNECTICUT RADIO



This Amateur "found it far superior"

Read this letter (from Pennsylvania) on the CONNECTICUT Variable Condenser.

"Have been using your unique two plate condenser for several weeks. Have tried it on a number of crystal hook-ups and have found it to be far superior in actions and stability than a ***** condenser which I am also using in my present hook up.

"I have also been able to cut out entirely NAA and other stations with your condenser, while it is impossible with the other.

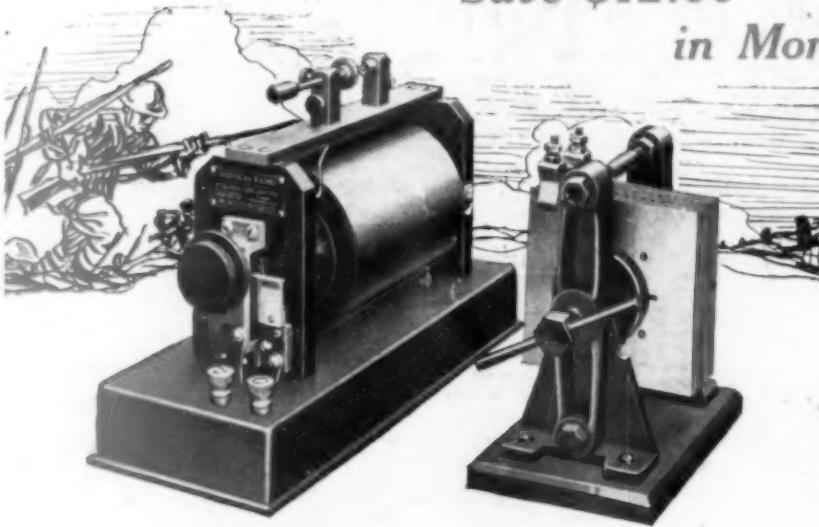
"I can sincerely say that this instrument for its size and work cannot be equalled. It is also a very fine addition to a Radio Outfit as it not only increases the receiving capacity, but also adds to the fine appearance of many outfits.

"Wishing you the best success with your new condenser I remain,"

Your results can be just as good.
Our booklet tells all about the
new Condenser — Send for it.

CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden Connecticut

Save \$12.00
in Money



Free During March

To help reduce QRM by the more extensive use of quenched gaps and low power, we offer FREE, FOR MARCH ONLY, one genuine Amrad $\frac{1}{4}$ K.W. Quenched Gap with every Amrad Induction Coil.

The Ideal Low Power Set

The Amrad Coil and Gap Set, Signal Corps design, is unbeatable for short range relays. All over the country this combination is pounding through.
IN TEXAS—40 to 50 miles, day and night on sixty watts.
IN WYOMING—30 miles day time on lowest possible power.
IN MICHIGAN—frequently mistaken for a transformer set.
IN CANADA—90 miles down the St. Lawrence, from Montreal to Three Rivers.
IN BROOKLYN—2CX repeatedly copied by SAY in Cleveland!
and many more.

Induction Coil Always Useful

You'll always need this efficient 100 watt Coil. It's a bear for I.C.W. Will modulate 250 watt tube. New armature is now fitted to Amrad Vibrators to give clear 240 cycle note. Only platinum contacts used. 50,000 volts from secondary delivers that whale of a punch.

A Real Gap Too

Efficient with either Amrad Coil or $\frac{1}{4}$ K.W. transformer. 5XD doing over 600 miles regularly with latter. New leak-proof gaskets insure permanent quenching and a smooth note.

RELAY MEN: Get after this QRM menace. Encourage use of low power sets tuned sharply on lower wavelengths. Popularize the counter-poise, the quenched gap, the minimum power regulation and see your troubles dissipate. We want to help. Your dealer wants to help. Get from him today schedule of Amrad broadcasts to be sent out by the Amrad Coil and Gap to show what they will do.

Regular Price Amrad 6 volt Induction Coil.....	\$35.75
Regular Price Amrad $\frac{1}{4}$ K.W. Quenched Gap.....	\$12.00
For March Only, Coil and Gap, at Your Nearest Dealer.....	\$35.75

AMERICAN RADIO AND RESEARCH CORPORATION

13 Park Row
New York

Address all Communications to New York.

Factory and Laboratory
Medford Hillside, Mass.

